An efficient and pH-universal ruthenium-based catalyst for the hydrogen evolution reaction

DOI: 10.1038/nnano.2016.304
Nature Nanotechnology, 2017, 12, 441-446.

#	Paper	IF	Citations
1070	.		
1069	Mesoporous Pd@Ru CoreShell Nanorods for Hydrogen Evolution Reaction in Alkaline Solution.		
1068	Scalable Synthesis of a Ruthenium-Based Electrocatalyst as a Promising Alternative to Pt for Hydrogen Evolution Reaction.		
1067	Versatile Route To Fabricate Precious-Metal Phosphide Electrocatalyst for Acid-Stable Hydrogen Oxidation and Evolution Reactions.		
1066	Nitrogen-Doped Carbon-Stabilized Ru Nanoclusters as Excellent Catalysts for Hydrogen Production.		
1065	High-Performance Ru@C4N Electrocatalyst for Hydrogen Evolution Reaction in Both Acidic and Alkaline Solutions.		
1064	Ruthenium-Decorated Cobalt Selenide Nanocrystals for Hydrogen Evolution.		
1063	Highly Dispersed Ruthenium-Based Multifunctional Electrocatalyst.		
1062	Identifying Electrocatalytic Sites of the Nanoporous CopperRuthenium Alloy for Hydrogen Evolution Reaction in Alkaline Electrolyte.		
1061	Cow Dung Derived PdNPs@WO3 Porous Carbon Nanodiscs as Trifunctional Catalysts for Design of ZincAir Batteries and Overall Water Splitting.		
1060	Highly Crystalline Pd13Cu3S7 Nanoplates Prepared via Partial Cation Exchange of Cu1.81S Templates as an Efficient Electrocatalyst for the Hydrogen Evolution Reaction.		
1059	Well-Defined 2D Covalent Organic Polymers for Energy Electrocatalysis. **2017**, 2, 1308-1314		87
1058	IrO2TiO2 electrocatalysts for the hydrogen evolution reaction in acidic water electrolysis without activation. **2017**, 41, 6152-6159		23
1057	Two-dimensional materials confining single atoms for catalysis. **2017**, 38, 1443-1453		45
1056	A porous Ru nanomaterial as an efficient electrocatalyst for the hydrogen evolution reaction under acidic and neutral conditions. **2017**, 53, 11713-11716		66
1055	Encased Copper Boosts the Electrocatalytic Activity of N-Doped Carbon Nanotubes for Hydrogen Evolution. **2017**, 9, 36857-36864		60
1054	Identification of pH-dependent synergy on Ru/MoS interface: a comparison of alkaline and acidic hydrogen evolution. **2017**, 9, 16616-16621		95

1053	Bimetallic Ru-Co Clusters Derived from a Confined Alloying Process within Zeolite-Imidazolate Frameworks for Efficient NH Decomposition and Synthesis. **2017**, 9, 39450-39455	30
1052	A nanohybrid consisting of NiPS3 nanoparticles coupled with defective graphene as a pH-universal electrocatalyst for efficient hydrogen evolution. **2017**, 5, 23536-23542	102
1051	Tailoring the Electronic Band Gap and Band Edge Positions in the C2N Monolayer by P and As Substitution for Photocatalytic Water Splitting. **2017**, 121, 22216-22224	49
1050	Tuning the confinement space of N-carbon shell-coated ruthenium nanoparticles: highly efficient electrocatalysts for hydrogen evolution reaction. **2017**, 7, 4964-4970	30
1049	Hydrogen evolution reaction activity of nickel phosphide is highly sensitive to electrolyte pH. **2017**, 5, 20390-20397	71
1048	RuP2-Based Catalysts with Platinum-like Activity and Higher Durability for the Hydrogen Evolution Reaction at All pH Values. **2017**, 129, 11717-11722	78
1047	RuP -Based Catalysts with Platinum-like Activity and Higher Durability for the Hydrogen Evolution Reaction at All pH Values. **2017**, 56, 11559-11564	429
1046	Porous Cobalt Phosphide Polyhedrons with Iron Doping as an Efficient Bifunctional Electrocatalyst. **2017**, 13, 1701167	59
1045	Induced Superaerophobicity onto a Non-superaerophobic Catalytic Surface for Enhanced Hydrogen Evolution Reaction. **2017**, 9, 43674-43680	19
1044	Ruthenium/nitrogen-doped carbon as an electrocatalyst for efficient hydrogen evolution in alkaline solution. **2017**, 5, 25314-25318	94
1043	Ru decorated with NiCoP: an efficient and durable hydrogen evolution reaction electrocatalyst in both acidic and alkaline conditions. **2017**, 53, 13153-13156	81
1042	Macroporous Inverse Opal-like MoC with Incorporated Mo Vacancies for Significantly Enhanced Hydrogen Evolution. **2017**, 11, 7527-7533	84
1041	Engineering NiMo3S4|Ni3S2 interface for excellent hydrogen evolution reaction in alkaline medium. **2017**, 258, 669-676	12
1040	Ultrathin two-dimensional materials for photo- and electrocatalytic hydrogen evolution. **2018**, 21, 749-770	147
1039	Ultrasmall RuP nanoparticles on graphene: a highly efficient hydrogen evolution reaction electrocatalyst in both acidic and alkaline media. **2018**, 54, 3343-3346	77
1038	Point Defect Effects on Photoelectronic Properties of the Potential Metal-Free C2N Photocatalysts: Insight from First-Principles Computations. **2018**, 122, 5291-5302	36
1037	Platinum nanoparticles deposited nitrogen-doped carbon nanofiber derived from bacterial cellulose for hydrogen evolution reaction. **2018**, 43, 6167-6176	22
1036	Total Water Splitting Catalyzed by Core–Shell Nanoparticles Encapsulated in Nitrogen-Doped Porous Carbon Derived from Metal–Organic Frameworks. **2018**, 6, 5105-5114	76

1035	P-Doped Ag Nanoparticles Embedded in N-Doped Carbon Nanoflake: An Efficient Electrocatalyst for the Hydrogen Evolution Reaction. **2018**, 6, 4499-4503	172
1034	Adsorption mechanisms of different volatile organic compounds onto pristine C2N and Al-doped C2N monolayer: A DFT investigation. **2018**, 450, 484-491	55
1033	Co3Se4 nanosheets embedded on N-CNT as an efficient electroactive material for hydrogen evolution and supercapacitor applications. **2018**, 65, 62-71	27
1032	Cobalt Molybdenum Oxide Derived High-Performance Electrocatalyst for the Hydrogen Evolution Reaction. **2018**, 8, 5062-5069	82
1031	Spatially Confined Assembly of Monodisperse Ruthenium Nanoclusters in a Hierarchically Ordered Carbon Electrode for Efficient Hydrogen Evolution. **2018**, 130, 5950-5954	10
1030	Spatially Confined Assembly of Monodisperse Ruthenium Nanoclusters in a Hierarchically Ordered Carbon Electrode for Efficient Hydrogen Evolution. **2018**, 57, 5848-5852	105
1029	Controllable Synthesis of Ruthenium Phosphides (RuP and RuP2) for pH-Universal Hydrogen Evolution Reaction. **2018**, 6, 6388-6394	52
1028	Computational screening of a single transition metal atom supported on the CN monolayer for electrochemical ammonia synthesis. **2018**, 20, 12835-12844	100
1027	Climbing the Volcano of Electrocatalytic Activity while Avoiding Catalyst Corrosion: Ni3P, a Hydrogen Evolution Electrocatalyst Stable in Both Acid and Alkali. **2018**, 8, 4408-4419	117
1026	Enhanced electrocatalytic performance for the hydrogen evolution reaction through surface enrichment of platinum nanoclusters alloying with ruthenium in situ embedded in carbon. **2018**, 11, 1232-1239	169
1025	Defect-rich (Co□oS2)x@Co9S8 nanosheets derived from monomolecular precursor pyrolysis with excellent catalytic activity for hydrogen evolution reaction. **2018**, 6, 7977-7987	32
1024	Efficient Hydrogen Production on a 3D Flexible Heterojunction Material. **2018**, 30, e1707082	124
1023	Boosting the hydrogen evolution performance of ruthenium clusters through synergistic coupling with cobalt phosphide. **2018**, 11, 1819-1827	256
1022	Ru nanodendrites composed of ultrathin fcc/hcp nanoblades for the hydrogen evolution reaction in alkaline solutions. **2018**, 54, 4613-4616	37
1021	One-pot synthesized boron-doped RhFe alloy with enhanced catalytic performance for hydrogen evolution reaction. **2018**, 230, 58-64	89
1020	Highly uniform Ru nanoparticles over N-doped carbon: pH and temperature-universal hydrogen release from water reduction. **2018**, 11, 800-806	286
1019	Van der Waals Heterostructures Comprised of Ultrathin Polymer Nanosheets for Efficient Z-Scheme Overall Water Splitting. **2018**, 130, 3512-3516	49
1018	Van der Waals Heterostructures Comprised of Ultrathin Polymer Nanosheets for Efficient Z-Scheme Overall Water Splitting. **2018**, 57, 3454-3458	176

1017	A Type of 1 nm Molybdenum Carbide Confined within Carbon Nanomesh as Highly Efficient Bifunctional Electrocatalyst. **2018**, 28, 1705967	58
1016	Ru Modulation Effects in the Synthesis of Unique Rod-like Ni@NiP-Ru Heterostructures and Their Remarkable Electrocatalytic Hydrogen Evolution Performance. **2018**, 140, 2731-2734	211
1015	Nanoceria-Supported Ruthenium(0) Nanoparticles: Highly Active and Stable Catalysts for Hydrogen Evolution from Water. **2018**, 10, 6299-6308	60
1014	Nickel Hydr(oxy)oxide Nanoparticles on Metallic MoS Nanosheets: A Synergistic Electrocatalyst for Hydrogen Evolution Reaction. **2018**, 5, 1700644	83
1013	Low-ruthenium-content NiRu nanoalloys encapsulated in nitrogen-doped carbon as highly efficient and pH-universal electrocatalysts for the hydrogen evolution reaction. **2018**, 6, 1376-1381	129
1012	Biomimetic organization of a ruthenium-doped collagen-based carbon scaffold for hydrogen evolution. **2018**, 6, 2311-2317	25
1011	Ultrafine and Ligand-Free Precious Metal (Ru, Ag, Au, Rh and Pd) Nanoclusters Supported on Phosphorus-Doped Carbon. **2018**, 24, 2565-2569	21
1010	An electrochemically neutralized energy-assisted low-cost acid-alkaline electrolyzer for energy-saving electrolysis hydrogen generation. **2018**, 6, 4948-4954	61
1009	Defect-enriched iron fluoride-oxide nanoporous thin films bifunctional catalyst for water splitting. **2018**, 9, 1809	137
1008	Prediction of two-dimensional nodal-line semimetals in a carbon nitride covalent network. **2018**, 6, 11252-11259	91
1007	Strain Effect in Bimetallic Electrocatalysts in the Hydrogen Evolution Reaction. **2018**, 3, 1198-1204	124
1006	A Monodisperse Rh2P-Based Electrocatalyst for Highly Efficient and pH-Universal Hydrogen Evolution Reaction. **2018**, 8, 1703489	139
1005	Ultrathin nitrogen-doped graphitized carbon shell encapsulating CoRu bimetallic nanoparticles for enhanced electrocatalytic hydrogen evolution. **2018**, 29, 225403	26
1004	A strategy for highly dispersed Mo2C/MoN hybrid nitrogen-doped graphene via ion-exchange resin synthesis for efficient electrocatalytic hydrogen reduction. **2018**, 11, 4535-4548	38
1003	Emerging Two-Dimensional Nanomaterials for Electrocatalysis. **2018**, 118, 6337-6408	1057
1002	Efficient Hydrogen Evolution on Cu Nanodots-Decorated NiS Nanotubes by Optimizing Atomic Hydrogen Adsorption and Desorption. **2018**, 140, 610-617	410
1001	Surface spintronics enhanced photo-catalytic hydrogen evolution: Mechanisms, strategies, challenges and future. **2018**, 434, 643-668	33
1000	Generalized Synthesis of Ultrathin Cobalt-Based Nanosheets from Metallophthalocyanine-Modulated Self-Assemblies for Complementary Water Electrolysis. **2018**, 14, 1702896	28

999	Scalable synthesis of two-dimensional nano-sheet materials with chlorophyll extracts: enhancing the hydrogen evolution reaction. **2018**, 20, 525-533	9
998	Rapidly catalysis of oxygen evolution through sequential engineering of vertically layered FeNi structure. **2018**, 43, 359-367	39
997	Electrocatalysts for Hydrogen Evolution in Alkaline Electrolytes: Mechanisms, Challenges, and Prospective Solutions. **2018**, 5, 1700464	647
996	Amorphous Y(OH)-promoted Ru/Y(OH) nanohybrids with high durability for electrocatalytic hydrogen evolution in alkaline media. **2018**, 54, 12202-12205	12
995	An ultrafine ruthenium nanocrystal with extremely high activity for the hydrogen evolution reaction in both acidic and alkaline media. **2018**, 54, 13076-13079	31
994	Heterostructured Electrocatalysts for Hydrogen Evolution Reaction Under Alkaline Conditions. **2018**, 10, 75	223
993	Effect of Linking Pattern of Dibenzothiophene-S,S-dioxide-Containing Conjugated Microporous Polymers on the Photocatalytic Performance. **2018**, 51, 9502-9508	73
992	Efficient CO Utilization via a Hybrid Na-CO System Based on CO Dissolution. **2018**, 9, 278-285	24
991	Accelerating water dissociation kinetics by isolating cobalt atoms into ruthenium lattice. **2018**, 9, 4958	147
990	Lead cathodes functionalized with magnetite particles with enhanced electrocatalytic activity for hydrogen evolution reaction in sulfuric acid solutions. **2018**, 43, 23239-23254	2
989	Sulfur-Doped Dicobalt Phosphide Outperforming Precious Metals as a Bifunctional Electrocatalyst for Alkaline Water Electrolysis. **2018**, 30, 8861-8870	50
988	Rational Design of Carbon Nitride Materials by Supramolecular Preorganization of Monomers. **2018**, 10, 5573-5586	73
987	Encapsulating Iridium Nanoparticles Inside a 3D Cage-Like Organic Network as an Efficient and Durable Catalyst for the Hydrogen Evolution Reaction. **2018**, 30, e1805606	69
986	Molybdenum-Based Carbon Hybrid Materials to Enhance the Hydrogen Evolution Reaction. **2018**, 24, 18158-18179	33
985	Ligand-Capped Ru Nanoparticles as Efficient Electrocatalyst for the Hydrogen Evolution Reaction. **2018**, 8, 11094-11102	53
984	Interfacing nickel nitride and nickel boosts both electrocatalytic hydrogen evolution and oxidation reactions. **2018**, 9, 4531	241
983	Ir/g-CN/Nitrogen-Doped Graphene Nanocomposites as Bifunctional Electrocatalysts for Overall Water Splitting in Acidic Electrolytes. **2018**, 10, 39161-39167	42
982	Mechanochemically Assisted Synthesis of a Ru Catalyst for Hydrogen Evolution with Performance Superior to Pt in Both Acidic and Alkaline Media. **2018**, 30, e1803676	125

981	Ultrasmall Ru/Cu-doped RuO Complex Embedded in Amorphous Carbon Skeleton as Highly Active Bifunctional Electrocatalysts for Overall Water Splitting. **2018**, 14, e1803009	104
980	Group-VIII transition metal boride as promising hydrogen evolution reaction catalysts. **2018**, 20, 27752-27757	11
979	Ruthenium nanoparticles modified oxidized, N-doped carbon substrates: Hydrogen generation electrocatalysts in alkaline and acidic conditions. **2018**, 220, 299-307	2
978	Highly Efficient, Biochar-Derived Molybdenum Carbide Hydrogen Evolution Electrocatalyst. **2018**, 8, 1801461	49
977	Scalable Solid-State Synthesis of Highly Dispersed Uncapped Metal (Rh, Ru, Ir) Nanoparticles for Efficient Hydrogen Evolution. **2018**, 8, 1801698	105
976	Spherical Ruthenium Disulfide-Sulfur-Doped Graphene Composite as an Efficient Hydrogen Evolution Electrocatalyst. **2018**, 10, 34098-34107	41
975	Construction of Porous Mo3P/Mo Nanobelts as Catalysts for Efficient Water Splitting. **2018**, 130, 14335-14339	6
974	Construction of Porous Mo P/Mo Nanobelts as Catalysts for Efficient Water Splitting. **2018**, 57, 14139-14143	53
973	Mesoporous Pd@Ru Core-Shell Nanorods for Hydrogen Evolution Reaction in Alkaline Solution. **2018**, 10, 34147-34152	48
972	Single-Atom Pt Catalyst for Effective C□ Bond Activation via Hydrodefluorination. **2018**, 8, 9353-9358	41
971	Reduced graphene oxide supported PdNi alloy nanocrystals for the oxygen reduction and methanol oxidation reactions. **2018**, 3, 375-383	15
970	Ultrasmall Ru Nanoclusters on Nitrogen-Enriched Hierarchically Porous Carbon Support as Remarkably Active Catalysts for Hydrolysis of Ammonia Borane. **2018**, 10, 4910-4916	24
969	Molecule-Assisted Synthesis of Highly Dispersed Ultrasmall RuO2 Nanoparticles on Nitrogen-Doped Carbon Matrix as Ultraefficient Bifunctional Electrocatalysts for Overall Water Splitting. **2018**, 6, 11529-11535	39
968	Pt-Pd co-electrodeposited nitrogenous loofah sponge as efficient pH-universal electrocatalyst for hydrogen evolution reaction. **2018**, 822, 10-16	18
967	Crystallinity Dependence of Ruthenium Nanocatalyst toward Hydrogen Evolution Reaction. **2018**, 8, 5714-5720	107
966	Activating rhodium phosphide-based catalysts for the pH-universal hydrogen evolution reaction. **2018**, 10, 12407-12412	68
965	Facile synthesis of Pd@Ru nanoplates with controlled thickness as efficient catalysts for hydrogen evolution reaction. **2018**, 20, 4230-4236	15
964	Transition metal anchored C2N monolayers as efficient bifunctional electrocatalysts for hydrogen and oxygen evolution reactions. **2018**, 6, 11446-11452	133

963	Hierarchical CoP/Ni5P4/CoP microsheet arrays as a robust pH-universal electrocatalyst for efficient hydrogen generation. **2018**, 11, 2246-2252	204
962	Ultrathin Transition Metal Dichalcogenide/3d Metal Hydroxide Hybridized Nanosheets to Enhance Hydrogen Evolution Activity. **2018**, 30, e1801171	134
961	Recent progress in single-atom electrocatalysts: concept, synthesis, and applications in clean energy conversion. **2018**, 6, 14025-14042	160
960	Engineering nanoporous Ag/Pd core/shell interfaces with ultrathin Pt doping for efficient hydrogen evolution reaction over a wide pH range. **2018**, 6, 14281-14290	28
959	Metal Surface and Interface Energy Electrocatalysis: Fundamentals, Performance Engineering, and Opportunities. **2018**, 4, 2054-2083	140
958	Synthesis of Hierarchical 4H/fcc Ru Nanotubes for Highly Efficient Hydrogen Evolution in Alkaline Media. **2018**, 14, e1801090	52
957	Facile synthesis of effective Ru nanoparticles on carbon by adsorption-low temperature pyrolysis strategy for hydrogen evolution. **2018**, 6, 14380-14386	63
956	Anchoring and space-confinement effects to form ultrafine Ru nanoclusters for efficient hydrogen generation. **2018**, 6, 13859-13866	42
955	Cu dimer anchored on CN monolayer: low-cost and efficient Bi-atom catalyst for CO oxidation. **2018** , 10, 15696-15705	48
954	Boron- and Nitrogen-Codoped Molybdenum Carbide Nanoparticles Imbedded in a BCN Network as a Bifunctional Electrocatalyst for Hydrogen and Oxygen Evolution Reactions. **2018**, 8, 8296-8305	80
953	Ternary PtVCo dendrites for the hydrogen evolution reaction, oxygen evolution reaction, overall water splitting and rechargeable Zn–air batteries. **2018**, 5, 2425-2431	17
952	Influence of Transition Metal on the Hydrogen Evolution Reaction over Nano-Molybdenum-Carbide Catalyst. **2018**, 8, 294	23
951	Synthesis and characterization of metal-diaminobipyridine complexes as low-cost co-catalysts for photo-sensitized hydrogen evolution. **2018**, 482, 821-829	1
950	Multifold Nanostructuring and Atomic-Scale Modulation of Cobalt Phosphide to Significantly Boost Hydrogen Production. **2018**, 24, 13800-13806	10
949	Phase-selective synthesis of self-supported RuP films for efficient hydrogen evolution electrocatalysis in alkaline media. **2018**, 10, 13930-13935	47
948	Towards High-Efficiency Hydrogen Production through in situ Formation of Well-Dispersed Rhodium Nanoclusters. **2018**, 11, 3253-3258	44
947	Titania, zirconia and hafnia supported ruthenium(0) nanoparticles: Highly active hydrogen evolution catalysts. **2018**, 531, 570-577	9
946	S, N co-doped carbon nanotube-encapsulated core-shelled CoS2@Co nanoparticles: efficient and stable bifunctional catalysts for overall water splitting. **2018**, 63, 1130-1140	156

945	Ultralow Overpotential of Hydrogen Evolution Reaction using Fe-Doped Defective Graphene: A Density Functional Study. **2018**, 10, 4450-4455	10
944	Low Loading of RhxP and RuP on N, P Codoped Carbon as Two Trifunctional Electrocatalysts for the Oxygen and Hydrogen Electrode Reactions. **2018**, 8, 1801478	131
943	Wrinkled Rh2P Nanosheets as Superior pH-Universal Electrocatalysts for Hydrogen Evolution Catalysis. **2018**, 8, 1801891	77
942	Scalable Synthesis of a Ruthenium-Based Electrocatalyst as a Promising Alternative to Pt for Hydrogen Evolution Reaction. **2018**, 10, 32171-32179	22
941	Crystalline Ru Se Nanoparticles-Decorated TiO Nanotube Arrays for Enhanced Hydrogen Evolution Reaction. **2018**, 14, e1802132	33
940	Well-Defined Ru Nanoclusters Anchored on Carbon: Facile Synthesis and High Electrochemical Activity toward Alkaline Water Splitting. **2018**, 6, 11487-11492	39
939	Co0.85Se hollow nanospheres anchored on N-doped graphene nanosheets as highly efficient, nonprecious electrocatalyst for hydrogen evolution reaction in both acid and alkaline media. **2018**, 400, 232-241	67
938	Ni-doped amorphous iron phosphide nanoparticles on TiN nanowire arrays: An advanced alkaline hydrogen evolution electrocatalyst. **2018**, 53, 66-73	72
937	Bigger is Surprisingly Better: Agglomerates of Larger RuP Nanoparticles Outperform Benchmark Pt Nanocatalysts for the Hydrogen Evolution Reaction. **2018**, 30, e1800047	139
936	Preparation of 2D material dispersions and their applications. **2018**, 47, 6224-6266	291
935	Efficient and Robust Hydrogen Evolution: Phosphorus Nitride Imide Nanotubes as Supports for Anchoring Single Ruthenium Sites. **2018**, 130, 9639-9644	21
934	Size and Electronic Modulation of Iridium Nanoparticles on Nitrogen-Functionalized Carbon toward Advanced Electrocatalysts for Alkaline Water Splitting. **2018**, 10, 22340-22347	31
933	Crystal Phase and Architecture Engineering of Lotus-Thalamus-Shaped Pt-Ni Anisotropic Superstructures for Highly Efficient Electrochemical Hydrogen Evolution. **2018**, 30, e1801741	128
932	Electrochemical Hydrogen Evolution Reaction Efficiently Catalyzed by Ru P Nanoparticles. **2018**, 11, 2724-2729	71
931	Efficient and Robust Hydrogen Evolution: Phosphorus Nitride Imide Nanotubes as Supports for Anchoring Single Ruthenium Sites. **2018**, 57, 9495-9500	140
930	Ru2P Nanoparticle Decorated P/N-Doped Carbon Nanofibers on Carbon Cloth as a Robust Hierarchical Electrocatalyst with Platinum-Comparable Activity toward Hydrogen Evolution. **2018**, 1, 3143-3150	34
929	Carbon-Quantum-Dots-Loaded Ruthenium Nanoparticles as an Efficient Electrocatalyst for Hydrogen Production in Alkaline Media. **2018**, 30, e1800676	280
928	Fabricating Metal@N-Doped Carbon Catalysts via a Thermal Method. **2018**, 8, 7077-7085	43

927	Electrodeposited Rhodium Phosphide with High Activity for Hydrogen Evolution Reaction in Acidic Medium. **2019**, 7, 14041-14050	14
926	NiMo Solid Solution Nanowire Array Electrodes for Highly Efficient Hydrogen Evolution Reaction. **2019**, 29, 1903747	55
925	In Situ Modification of a Delafossite-Type PdCoO Bulk Single Crystal for Reversible Hydrogen Sorption and Fast Hydrogen Evolution. **2019**, 4, 2185-2191	19
924	CuP-NiP Hybrid Hexagonal Nanosheet Arrays for Efficient Hydrogen Evolution Reaction in Alkaline Solution. **2019**, 58, 11630-11635	24
923	Metal boride better than Pt: HCP Pd2B as a superactive hydrogen evolution reaction catalyst. **2019**, 12, 3099-3105	63
922	Improving selectivity of CO reduction via reducing the coordination of critical intermediates. **2019**, 7, 24000-24004	6
921	Anchoring ultrafine PtNi nanoparticles on N-doped graphene for highly efficient hydrogen evolution reaction. **2019**, 9, 4961-4969	12
920	Metal-Free B@-CN: Visible/Infrared Light-Driven Single Atom Photocatalyst Enables Spontaneous Dinitrogen Reduction to Ammonia. **2019**, 19, 6391-6399	138
919	Electrocatalytically inactive SnS2 promotes water adsorption/dissociation on molybdenum dichalcogenides for accelerated alkaline hydrogen evolution. **2019**, 64, 103918	37
918	Intermediate Modulation on Noble Metal Hybridized to 2D Metal-Organic Framework for Accelerated Water Electrocatalysis. **2019**, 5, 2429-2441	95
917	Ruthenium and cobalt bimetal encapsulated in nitrogen-doped carbon material derived of ZIF-67 as enhanced hydrogen evolution electrocatalyst. **2019**, 494, 101-110	22
916	Ru nanoassembly catalysts for hydrogen evolution and oxidation reactions in electrolytes at various pH values. **2019**, 258, 117952	58
915	Lamellar platinum□hodium aerogels with superior electrocatalytic performance for both hydrogen oxidation and evolution reaction in alkaline environment. **2019**, 435, 226798	23
914	Carbon dots-Pt modified polyaniline nanosheet grown on carbon cloth as stable and high-efficient electrocatalyst for hydrogen evolution in pH-universal electrolyte. **2019**, 257, 117905	37
913	Visible-light-enhanced electrocatalytic hydrogen production on semimetal bismuth nanorods. **2019**, 494, 293-300	5
912	Hydrothermal synthesis of spherical Ru with high efficiency hydrogen evolution activity. **2019**, 848, 113320	2
911	Hollow bimetallic M-Fe-P (M=Mn, Co, Cu) nanoparticles as efficient electrocatalysts for hydrogen evolution reaction. **2019**, 44, 22806-22815	10
910	Electronic structure engineering of single atomic Ru by Ru nanoparticles to enable enhanced activity for alkaline water reduction. **2019**, 7, 19531-19538	20

909	Overwhelming the Performance of Single Atoms with Atomic Clusters for Platinum-Catalyzed Hydrogen Evolution. **2019**, 9, 8213-8223	36
908	Design and optimization of cobalt-encapsulating vertical graphene nano-hills for hydrogen evolution reaction. **2019**, 7, 17046-17052	7
907	Visualizing spatial potential and charge distribution in Ru/N-doped carbon electrocatalysts for superior hydrogen evolution reaction. **2019**, 7, 18072-18080	30
906	Regulating the electron density of dual transition metal sulfide heterostructures for highly efficient hydrogen evolution in alkaline electrolytes. **2019**, 11, 14016-14023	18
905	Nitrogen Atoms as Stabilizers and Promoters for Ru-Cluster-Catalyzed Alkaline Water Splitting. **2019**, 11, 4327-4333	9
904	Cable-like Ru/WNO@C nanowires for simultaneous high-efficiency hydrogen evolution and low-energy consumption chlor-alkali electrolysis. **2019**, 12, 2569-2580	79
903	Three-dimensional open nano-netcage electrocatalysts for efficient pH-universal overall water splitting. **2019**, 10, 4875	119
902	Heteroatom-Mediated Interactions between Ruthenium Single Atoms and an MXene Support for Efficient Hydrogen Evolution. **2019**, 31, e1903841	197
901	Surface Engineering of 3D Gas Diffusion Electrodes for High-Performance H2 Production with Nonprecious Metal Catalysts. **2019**, 9, 1901824	7
900	Surface-Electron Coupling for Efficient Hydrogen Evolution. **2019**, 131, 17873-17881	8
899	Protonation-Assisted Exfoliation of N-Containing 2D Conjugated Polymers. **2019**, 15, e1903643	15
898	Synthesis of ultrafine ruthenium phosphide nanoparticles and nitrogen/phosphorus dual-doped carbon hybrids as advanced electrocatalysts for all-pH hydrogen evolution reaction. **2019**, 44, 25632-25641	8
897	Synthesis of RuNi alloy nanostructures composed of multilayered nanosheets for highly efficient electrocatalytic hydrogen evolution. **2019**, 66, 104173	53
896	Oxygen-terminated BiXenes and derived single atom catalysts for the hydrogen evolution reaction. **2019**, 378, 97-103	22
895	Self-crosslinking carbon dots loaded ruthenium dots as an efficient and super-stable hydrogen production electrocatalyst at all pH values. **2019**, 65, 104023	80
894	Surface-Electron Coupling for Efficient Hydrogen Evolution. **2019**, 58, 17709-17717	28
893	Rapid, High-Temperature, In Situ Microwave Synthesis of Bulk Nanocatalysts. **2019**, 15, e1904881	15
892	Reversing the charge transfer between platinum and sulfur-doped carbon support for electrocatalytic hydrogen evolution. **2019**, 10, 4977	122

891	Amorphous Ruthenium-Sulfide with Isolated Catalytic Sites for Pt-Like Electrocatalytic Hydrogen Production Over Whole pH Range. **2019**, 15, e1904043	35
890	Metal (M□= Ru, Pd and Co) embedded in C2N with enhanced lithium storage properties. **2019**, 14, 100359	9
889	Single-Atom Ru Doping Induced Phase Transition of MoS2 and S Vacancy for Hydrogen Evolution Reaction. **2019**, 3, 1900653	111
888	Ruthenium□Cobalt Nanoalloy Embedded within Hollow Carbon Spheres as a Bifunctionally Robust Catalyst for Hydrogen Generation from Water Splitting and Ammonia Borane Hydrolysis. **2019**, 7, 18744-18752	35
887	Investigation of selective chemisorption of fcc and hcp Ru nanoparticles using X-ray photoelectron spectroscopy analysis. **2019**, 380, 247-253	4
886	Direct Hybridization of Noble Metal Nanostructures on 2D Metal-Organic Framework Nanosheets To Catalyze Hydrogen Evolution. **2019**, 19, 8447-8453	93
885	Amorphous MoS2 confined in nitrogen-doped porous carbon for improved electrocatalytic stability toward hydrogen evolution reaction. **2019**, 12, 3116-3122	16
884	Interstitial Hydrogen Atom Modulation to Boost Hydrogen Evolution in Pd-Based Alloy Nanoparticles. **2019**, 13, 12987-12995	36
883	High electrocatalytic hydrogen evolution activity on a coupled Ru and CoO hybrid electrocatalyst. **2019**, 37, 143-147	21
882	Modulating the surface segregation of PdCuRu nanocrystals for enhanced all-pH hydrogen evolution electrocatalysis. **2019**, 7, 20151-20157	27
881	Iridium on vertical graphene as an all-round catalyst for robust water splitting reactions. **2019**, 7, 20590-20596	31
880	Atomic and electronic modulation of self-supported nickel-vanadium layered double hydroxide to accelerate water splitting kinetics. **2019**, 10, 3899	194
879	Facile Construction of IrRh Nanosheet Assemblies As Efficient and Robust Bifunctional Electrocatalysts for Overall Water Splitting. **2019**, 7, 15747-15754	19
878	Balancing hydrogen adsorption/desorption by orbital modulation for efficient hydrogen evolution catalysis. **2019**, 10, 4060	70
877	Interface Charge Engineering of Ultrafine Ru/Ni2P Nanoparticles Encapsulated in N,P-Codoped Hollow Carbon Nanospheres for Efficient Hydrogen Evolution. **2019**, 7, 17714-17722	15
876	Recent Advances and Prospective in Ruthenium-Based Materials for Electrochemical Water Splitting. **2019**, 9, 9973-10011	269
875	1T/2H MoSe2-on-MXene heterostructure as bifunctional electrocatalyst for efficient overall water splitting. **2019**, 326, 134976	53
874	Single Mn atom as a promising electrocatalyst for CO reduction to C2H5OH and C3H6: A computational study. **2019**, 498, 143868	8

873	Kinetics-assisted discrimination of active sites in Ru catalyzed hydrolytic dehydrogenation of ammonia borane. **2019**, 4, 316-322	16
872	Enhanced synergistic catalysis by a novel triple-phase interface design of NiO/Ru@Ni for the hydrogen evolution reaction. **2019**, 7, 2344-2350	43
871	Downshifted d-Band Center of Ru/MWCNTs by Turbostratic Carbon Nitride for Efficient and Robust Hydrogen Evolution in Alkali. **2019**, 11, 1970-1976	24
870	pH-Universal Water Splitting Catalyst: Ru-Ni Nanosheet Assemblies. **2019**, 11, 492-504	67
869	Recent progress in electrocatalytic nitrogen reduction. **2019**, 7, 3531-3543	199
868	Ni(OH)2/ NiSe2 hybrid nanosheet arrays for enhanced alkaline hydrogen evolution reaction. **2019**, 44, 4832-4838	25
867	Approaching the Volcano Top: Iridium/Silicon Nanocomposites as Efficient Electrocatalysts for the Hydrogen Evolution Reaction. **2019**, 13, 2786-2794	57
866	In-situ synthesis of porous Ni2P nanosheets for efficient and stable hydrogen evolution reaction. **2019**, 44, 5739-5747	40
865	Upraising the O 2p Orbital by Integrating Ni with MoO2 for Accelerating Hydrogen Evolution Kinetics. **2019**, 9, 2275-2285	103
864	Ruthenium@N-doped graphite carbon derived from carbon foam for efficient hydrogen evolution reaction. **2019**, 55, 965-968	39
863	Electrochemical hydrogen evolution reaction boosted by constructing Ru nanoparticles assembled as a shell over semimetal Te nanorod surfaces in acid electrolyte. **2019**, 55, 1490-1493	54
862	Hollow carbon shells enhanced by confined ruthenium as cost-efficient and superior catalysts for the alkaline hydrogen evolution reaction. **2019**, 7, 6676-6685	45
861	Engineering multiphase for activating electroactive sites for highly efficient hydrogen evolution: Experimental and theoretical investigation. **2019**, 44, 13323-13333	2
860	Construction of nickel-doped cobalt hydroxides hexagonal nanoplates for advanced oxygen evolution electrocatalysis. **2019**, 553, 713-719	8
859	Promoting Subordinate, Efficient Ruthenium Sites with Interstitial Silicon for Pt-Like Electrocatalytic Activity. **2019**, 131, 11531	
858	Negative Charging of Transition-Metal Phosphides via Strong Electronic Coupling for Destabilization of Alkaline Water. **2019**, 131, 11922-11926	12
857	Tuning electronic and composition effects in ruthenium-copper alloy nanoparticles anchored on carbon nanofibers for rechargeable Li-CO2 batteries. **2019**, 375, 121978	26
856	Monodispersed platinum nanoparticles embedded in Ni3S2-containing hollow carbon spheres with ultralow Pt loading and high alkaline hydrogen evolution activity. **2019**, 318, 590-596	7

855	Polyaniline-coated Ru/Ni(OH)2 nanosheets for hydrogen evolution reaction over a wide pH range. **2019**, 375, 249-256	27
854	A Fully Reversible Water Electrolyzer Cell Made Up from FeCoNi (Oxy)hydroxide Atomic Layers. **2019**, 9, 1901312	69
853	In-situ coalesced vacancies on MoSe2 mimicking noble metal: Unprecedented Tafel reaction in hydrogen evolution. **2019**, 63, 103846	24
852	Platinum single-atom and cluster anchored on functionalized MWCNTs with ultrahigh mass efficiency for electrocatalytic hydrogen evolution. **2019**, 63, 103849	57
851	Recent progress made in the mechanism comprehension and design of electrocatalysts for alkaline water splitting. **2019**, 12, 2620-2645	532
850	Atomically dispersed platinum supported on curved carbon supports for efficient electrocatalytic hydrogen evolution. **2019**, 4, 512-518	419
849	Promoting Subordinate, Efficient Ruthenium Sites with Interstitial Silicon for Pt-Like Electrocatalytic Activity. **2019**, 58, 11409-11413	82
848	Negative Charging of Transition-Metal Phosphides via Strong Electronic Coupling for Destabilization of Alkaline Water. **2019**, 58, 11796-11800	101
847	Highly Efficient CO Utilization via Aqueous Zinc- or Aluminum-CO Systems for Hydrogen Gas Evolution and Electricity Production. **2019**, 58, 9506-9511	21
846	Nanoporous Palladium Silver Surface Alloys as Efficient and pH-Universal Catalysts for the Hydrogen Evolution Reaction. **2019**, 4, 1379-1386	44
845	Hierarchically heterostructured metal hydr(oxy)oxides for efficient overall water splitting. **2019**, 11, 11736-11743	9
844	Highly Efficient CO2 Utilization via Aqueous Zinc or Aluminum CO2 Systems for Hydrogen Gas Evolution and Electricity Production. **2019**, 131, 9606-9611	0
843	Ru Se@MoS hybrid as a highly efficient electrocatalyst toward hydrogen evolution reaction.. **2019**, 9, 13486-13493	3
842	Enhanced the Hydrogen Evolution Performance by Ruthenium Nanoparticles Doped into Cobalt Phosphide Nanocages. **2019**, 7, 9737-9742	22
841	Hydrogenation of CO2 to formic acid on the single atom catalysis Cu/C2N: A first principles study. **2019**, 488, 1-9	23
840	Mechanochemically Assisted Synthesis of Ruthenium Clusters Embedded in Mesoporous Carbon for an Efficient Hydrogen Evolution Reaction. **2019**, 6, 2719-2725	9
839	High-Performance Ru@CN Electrocatalyst for Hydrogen Evolution Reaction in Both Acidic and Alkaline Solutions. **2019**, 11, 19176-19182	49
838	Immobilized Single Molecular Molybdenum Disulfide on Carbonized Polyacrylonitrile for Hydrogen Evolution Reaction. **2019**, 13, 6720-6729	27

837	Confined distribution of platinum clusters on MoO2 hexagonal nanosheets with oxygen vacancies as a high-efficiency electrocatalyst for hydrogen evolution reaction. **2019**, 62, 127-135	86
836	Pyrite-type ruthenium disulfide with tunable disorder and defects enables ultra-efficient overall water splitting. **2019**, 7, 14222-14232	32
835	Ru-RuO2/CNT hybrids as high-activity pH-universal electrocatalysts for water splitting within 0.73 V in an asymmetric-electrolyte electrolyzer. **2019**, 61, 576-583	95
834	Metal□rganic framework-derived hierarchical MoS2/CoS2 nanotube arrays as pH-universal electrocatalysts for efficient hydrogen evolution. **2019**, 7, 13339-13346	81
833	Atomic Arrangement Engineering of Metallic Nanocrystals for Energy-Conversion Electrocatalysis. **2019**, 3, 956-991	98
832	Decorating WSe2 nanosheets with ultrafine Ru nanoparticles for boosting electrocatalytic hydrogen evolution in alkaline electrolytes. **2019**, 6, 1382-1387	15
831	Single Atoms and Clusters Based Nanomaterials for Hydrogen Evolution, Oxygen Evolution Reactions, and Full Water Splitting. **2019**, 9, 1900624	294
830	Fe2O3 nanocatalysts on N-doped carbon nanomaterial for highly efficient electrochemical hydrogen evolution in alkaline. **2019**, 426, 74-83	29
829	Electrocatalytically driven fast removal of moisture by condensation of vapor and water splitting. **2019**, 61, 295-303	1
828	Ru doping in Ni(OH)2 to accelerate water reduction kinetics for efficient hydrogen evolution reaction. **2019**, 485, 506-512	26
827	Single and double boron atoms doped nanoporous CN-h2D electrocatalysts for highly efficient N reduction reaction: a density functional theory study. **2019**, 30, 335403	51
826	Cation vacancy-modulated PtPdRuTe five-fold twinned nanomaterial for catalyzing hydrogen evolution reaction. **2019**, 61, 346-351	22
825	Core Effect on the Performance of N/P Codoped Carbon Encapsulating Noble-Metal Phosphide Nanostructures for Hydrogen Evolution Reaction. **2019**, 2, 2645-2653	17
824	Highly Efficient Hydrogen Evolution from Seawater by Biofunctionalized Exfoliated MoS Quantum Dot Aerogel Electrocatalysts That Is Superior to Pt. **2019**, 11, 14159-14165	18
823	Searching General Sufficient-and-Necessary Conditions for Ultrafast Hydrogen-Evolving Electrocatalysis. **2019**, 29, 1900704	65
822	Oxygen Reduction Reactions of Fe-N-C Catalysts: Current Status and the Way Forward. **2019**, 2, 252-276	70
821	1 + 1? > 2: Heteronuclear Biatom Catalyst Outperforms Its Homonuclear Counterparts for CO Oxidation. **2019**, 3, 1800480	56
820	Support and Interface Effects in Water-Splitting Electrocatalysts. **2019**, 31, e1808167	314

819	Co2Ni alloy/N-doped CNTs composite as efficient hydrogen evolution reaction catalyst in alkaline medium. **2019**, 791, 779-785	25
818	Investigation of the correlation between the phase structure and activity of NiMoO derived electrocatalysts for the hydrogen evolution reaction. **2019**, 7, 10338-10345	14
817	Carbon-Based Substrates for Highly Dispersed Nanoparticle and Even Single-Atom Electrocatalysts. **2019**, 3, 1900050	52
816	Ruthenium-Based Single-Atom Alloy with High Electrocatalytic Activity for Hydrogen Evolution. **2019**, 9, 1803913	152
815	Ruthenium Nanoparticles for Catalytic Water Splitting. **2019**, 12, 2493-2514	50
814	Tailoring the Porosity in Iron Phosphosulfide Nanosheets to Improve the Performance of Photocatalytic Hydrogen Evolution. **2019**, 12, 2651-2659	23
813	Engineering hierarchical CoSe/NiFe layered-double-hydroxide nanoarrays as high efficient bifunctional electrocatalyst for overall water splitting. **2019**, 425, 138-146	63
812	Inlay of ultrafine Ru nanoparticles into a self-supported Ni(OH)2 nanoarray for hydrogen evolution with low overpotential and enhanced kinetics. **2019**, 7, 11062-11068	43
811	Low-Cost Porous Ruthenium Layer Deposited on Nickel Foam as a Highly Active Universal-pH Electrocatalyst for the Hydrogen Evolution Reaction. **2019**, 12, 2780-2787	17
810	Tailoring electrochemical efficiency of hydrogen evolution by fine tuning of TiOx/RuOx composite cathode architecture. **2019**, 44, 10593-10603	4
809	Nanostructured RheniumCarbon Composites as Hydrogen-Evolving Catalysts Effective over the Entire pH Range. **2019**, 2, 2725-2733	12
808	Directly immobilizing a Rutannic acid linkage coordination complex on carbon cloth: an efficient and ultrastable catalyst for the hydrogen evolution reaction. **2019**, 7, 11038-11043	21
807	Single-atom ruthenium based catalyst for enhanced hydrogen evolution. **2019**, 249, 91-97	96
806	Unified Catalyst for Efficient and Stable Hydrogen Production by Both the Electrolysis of Water and the Hydrolysis of Ammonia Borane. **2019**, 3, 1800161	35
805	Ruthenium atomically dispersed in carbon outperforms platinum toward hydrogen evolution in alkaline media. **2019**, 10, 631	260
804	Heteroatom-Doped Transition Metal Electrocatalysts for Hydrogen Evolution Reaction. **2019**, 4, 805-810	188
803	Boosting Water Dissociation Kinetics on Pt-Ni Nanowires by N-Induced Orbital Tuning. **2019**, 31, e1807780	113
802	Self-supported 3D porous N-Doped nickel selenide electrode for hydrogen evolution reaction over a wide range of pH. **2019**, 304, 202-209	27

801	Highly-dispersed Ru nanoparticles sputtered on graphene for hydrogen production. **2019**, 44, 7320-7325	14
800	Synergistic Effects of Mo2C-NC@CoxFey Core□Shell Nanoparticles in Electrocatalytic Overall Water Splitting Reaction. **2019**, 7, 1801121	5
799	Direct electrosynthesis of sodium hydroxide and hydrochloric acid from brine streams. **2019**, 2, 106-113	36
798	Titanium dioxide encapsulated carbon-nitride nanosheets derived from MXene and melamine-cyanuric acid composite as a multifunctional electrocatalyst for hydrogen and oxygen evolution reaction and oxygen reduction reaction. **2019**, 248, 366-379	149
797	Nanocomposites Based on Ruthenium Nanoparticles Supported on Cobalt and Nitrogen-Codoped Graphene Nanosheets as Bifunctional Catalysts for Electrochemical Water Splitting. **2019**, 11, 46912-46919	21
796	Pd-coated Ru nanocrystals supported on N-doped graphene as HER and ORR electrocatalysts. **2019**, 55, 13928-13931	26
795	Recent advances in two-dimensional materials and their nanocomposites in sustainable energy conversion applications. **2019**, 11, 21622-21678	109
794	Hierarchical nanoporous intermetallic compounds with self-grown transition-metal hydroxides as bifunctional catalysts for the alkaline hydrogen evolution reaction. **2019**, 7, 25925-25931	9
793	In Operando Stacking of Reduced Graphene Oxide for Active Hydrogen Evolution. **2019**, 11, 43460-43465	13
792	Amorphization activated ruthenium-tellurium nanorods for efficient water□splitting. **2019**, 10, 5692	130
791	A silver catalyst activated by stacking faults for the hydrogen evolution reaction. **2019**, 2, 1107-1114	128
790	Metallic ruthenium-based nanomaterials for electrocatalytic and photocatalytic hydrogen evolution. **2019**, 7, 24691-24714	44
789	Recent Progress in Graphene-Based Noble-Metal Nanocomposites for Electrocatalytic Applications. **2019**, 31, e1800696	156
788	Influence of hydrogen and halogen adsorption on the photocatalytic water splitting activity of C2N monolayer: A first-principles study. **2019**, 141, 50-58	29
787	Hierarchical □anoroll□ike MoS2/Ti3C2Tx hybrid with high electrocatalytic hydrogen evolution activity. **2019**, 241, 89-94	145
786	Ruthenium Nanoparticles Supported on Carbon Microfibers for Hydrogen Evolution Electrocatalysis. **2019**, 2019, 2071-2077	11
785	Ni Co O Nanoneedle Arrays Grown on Ni Foam as an Efficient Bifunctional Electrocatalyst for Full Water Splitting. **2019**, 14, 480-485	15
784	Proton Conduction in 2D Aza-Fused Covalent Organic Frameworks. **2019**, 31, 819-825	112

783	Charge-Redistribution-Enhanced Nanocrystalline Ru@IrOx Electrocatalysts for Oxygen Evolution in Acidic Media. **2019**, 5, 445-459	205
782	Highly exposed ruthenium-based electrocatalysts from bimetallic metal-organic frameworks for overall water splitting. **2019**, 58, 1-10	122
781	Identification of single-atom active sites in carbon-based cobalt catalysts during electrocatalytic hydrogen evolution. **2019**, 2, 134-141	409
780	An earth-abundant and multifunctional Ni nanosheets array as electrocatalysts and heat absorption layer integrated thermoelectric device for overall water splitting. **2019**, 56, 563-570	38
779	Metal-Organic Precursor□Derived Mesoporous Carbon Spheres with Homogeneously Distributed Molybdenum Carbide/Nitride Nanoparticles for Efficient Hydrogen Evolution in Alkaline Media. **2019**, 29, 1807419	68
778	Activating MoS2 Basal Plane with Ni2P Nanoparticles for Pt-Like Hydrogen Evolution Reaction in Acidic Media. **2019**, 29, 1809151	75
777	In Situ Growth of Ag Nanodots Decorated Cu O Porous Nanobelts Networks on Copper Foam for Efficient HER Electrocatalysis. **2019**, 15, e1804268	55
776	Morphology and surface chemistry engineering toward pH-universal catalysts for hydrogen evolution at high current density. **2019**, 10, 269	229
775	Isoelectronic analogues of graphene: the BCN monolayers with visible-light absorption and high carrier mobility. **2019**, 31, 125301	14
774	Ultrafine Ruthenium Oxide Nanoparticles Supported on Molybdenum Oxide Nanosheets as Highly Efficient Electrocatalyst for Hydrogen Evolution in Acidic Medium. **2019**, 11, 1495-1502	8
773	Highly Efficient Hydrogen Evolution from a Mesoporous Hybrid of Nickel Phosphide Nanoparticles Anchored on Cobalt Phosphosulfide/Phosphide Nanosheet Arrays. **2019**, 15, e1804272	65
772	Rhodium/silicon quantum dot/carbon quantum dot composites as highly efficient electrocatalysts for hydrogen evolution reaction with Pt-like performance. **2019**, 299, 828-834	15
771	Boosting the Electrocatalytic Water Oxidation Performance of CoFeO Nanoparticles by Surface Defect Engineering. **2019**, 11, 3978-3983	52
770	An investigation of Fe incorporation on the activity and stability of homogeneous (FexNi1-x)2P solid solutions as electrocatalysts for alkaline hydrogen evolution. **2019**, 294, 297-303	27
769	Understanding the synergetic interaction within □MoC/□Mo2C heterostructured electrocatalyst. **2019**, 35, 66-70	21
768	Design of Noble Metal Electrocatalysts on an Atomic Level. **2019**, 6, 289-303	23
767	Fused Aromatic Network Structures as a Platform for Efficient Electrocatalysis. **2019**, 31, e1805062	22
766	Nitrogen-Doped Carbon-Stabilized Ru Nanoclusters as Excellent Catalysts for Hydrogen Production. **2019**, 7, 1178-1184	49

765	Design and synthesis of ruthenium nanoparticles on polyanilines (nano Ru@PANIs) via Ru-catalyzed aerobic oxidative polymerization of anilines. **2019**, 234, 216-219	10
764	Single or Double: Which Is the Altar of Atomic Catalysts for Nitrogen Reduction Reaction?. **2019**, 3, 1800291	137
763	Ruthenium coordinated with triphenylphosphine-hyper-crosslinked polymer: An efficient catalyst for hydrogen evolution reaction and hydrolysis of ammonia borane. **2019**, 466, 193-201	34
762	Carbon cloth/transition metals-based hybrids with controllable architectures for electrocatalytic hydrogen evolution - A review. **2020**, 45, 7716-7740	51
761	Enhanced photocatalytic hydrogen and methane evolution using chalcogenide with metal ion modification via a microwave-assisted solvothermal method. **2020**, 355, 493-501	4
760	Ir-Based Alloy Nanoflowers with Optimized Hydrogen Binding Energy as Bifunctional Electrocatalysts for Overall Water Splitting. **2020**, 4, 1900129	50
759	Hierarchical molybdenum phosphide coupled with carbon as a whole pH-range electrocatalyst for hydrogen evolution reaction. **2020**, 260, 118196	81
758	Synergistically Interactive Pyridinic-N-MoP Sites: Identified Active Centers for Enhanced Hydrogen Evolution in Alkaline Solution. **2020**, 59, 8982-8990	134
757	Interface engineering in transition metal carbides for electrocatalytic hydrogen generation and nitrogen fixation. **2020**, 7, 32-53	39
756	Synergistically Interactive Pyridinic-N-MoP Sites: Identified Active Centers for Enhanced Hydrogen Evolution in Alkaline Solution. **2020**, 132, 9067-9075	24
755	Ag doping to boost the electrochemical performance and corrosion resistance of Ti/Sn-Sb-RuOx/β-PbO2/α-PbO2 electrode in zinc electrowinning. **2020**, 815, 152551	17
754	Recent Advances in Electrocatalytic Hydrogen Evolution Using Nanoparticles. **2020**, 120, 851-918	722
753	. **2020**, 35, 261-272	8
752	Atomically dispersed ruthenium sites on whisker-like secondary microstructure of porous carbon host toward highly efficient hydrogen evolution. **2020**, 8, 3203-3210	14
751	Recent advances in ruthenium-based electrocatalysts for the hydrogen evolution reaction. **2020**, 5, 43-56	101
750	Single-atom catalysts for electrochemical clean energy conversion: recent progress and perspectives. **2020**, 4, 996-1011	22
749	Neighboring effect induced by V and Cr doping in FeCoP nanoarrays for the hydrogen evolution reaction with Pt-like performance. **2020**, 8, 1184-1192	25
748	Surface Phosphation of 3D NiCo2O4 Nanowires Grown on Ni Foam as an Efficient Bifunctional Catalyst for Water Splitting. **2020**, 15, 2050024	3

747	Electrospun Ru-RuO/MoO carbon nanorods with multi-active components: a Pt-like catalyst for the hydrogen evolution reaction. **2020**, 56, 739-742	22
746	A promising blue phosphorene/CN van der Waals type-II heterojunction as a solar photocatalyst: a first-principles study. **2020**, 22, 615-623	20
745	Pd-Ru nanocatalysts derived from a Pd-induced aerogel for dramatic boosting of hydrogen release. **2020**, 12, 2345-2349	7
744	W supported on g-CN manifests high activity and selectivity for N2 electroreduction to NH3. **2020**, 8, 1378-1385	49
743	Electrochemical formation of PtRu bimetallic nanoparticles for highly efficient and pH-universal hydrogen evolution reaction. **2020**, 8, 2090-2098	23
742	Tuning the surface charge density of exfoliated thin molybdenum disulfide sheets via non-covalent functionalization for promoting hydrogen evolution reaction. **2020**, 8, 510-517	12
741	Cu active sites stabilization through Mott-Schottky effect for promoting highly efficient conversion of carbon monoxide into n-propanol. **2020**, 382, 49-56	15
740	Hollow Cobalt Sulfide Nanoparticles: A Robust and Low-Cost pH-Universal Oxygen Evolution Electrocatalyst. **2020**, 3, 977-986	17
739	General Strategy to Optimize Gas Evolution Reaction via Assembled Striped-Pattern Superlattices. **2020**, 142, 1857-1863	42
738	Molybdenum Sulfide Nanosheets Coupled with Ni2P Hollow Microspheres as an Efficient Electrocatalyst for Hydrogen Generation over a Wide pH Range Mediated by a 3D/2D Interface. **2020**, 7, 355-361	3
737	Efficient electrocatalytic water oxidation by using the hierarchical 1D/2D structural nanohybrid of CoCu-based zeolitic imidazolate framework nanosheets and graphdiyne nanowires. **2020**, 334, 135577	19
736	Recent Advances in Noble Metal (Pt, Ru, and Ir)-Based Electrocatalysts for Efficient Hydrogen Evolution Reaction. **2020**, 5, 31-40	149
735	RuNi Nanoparticles Embedded in N-Doped Carbon Nanofibers as a Robust Bifunctional Catalyst for Efficient Overall Water Splitting. **2020**, 7, 1901833	85
734	Emerged carbon nanomaterials from metal-organic precursors for electrochemical catalysis in energy conversion. **2020**, 393-423	4
733	Boosting the alkaline hydrogen evolution of Ru nanoclusters anchored on B/N doped graphene by accelerating water dissociation. **2020**, 68, 104301	60
732	Engineering grain boundaries at the 2D limit for the hydrogen evolution reaction. **2020**, 11, 57	72
731	Breaking scaling relations for efficient CO electrochemical reduction through dual-atom catalysts. **2020**, 11, 1807-1813	86
730	A general steam-assisted method for one-step synthesis of polymeric carbon nitride nanosheets with/without doping for efficient photocatalytic hydrogen evolution. **2020**, 12, 1939-1947	12

729	Holey graphitic carbon nitride (g-CN) supported bifunctional single atom electrocatalysts for highly efficient overall water splitting. **2020**, 264, 118521	61
728	In Situ-Fabricated Hydrogel Polymer Semiconductor Nanocomposite Thin Film as a Highly Efficient and Robust Electrocatalyst for Hydrogen Evolution Reaction. **2020**, 124, 44-51	5
727	Ruthenium Nanoparticles Anchored on Graphene Hollow Nanospheres Superior to Platinum for the Hydrogen Evolution Reaction in Alkaline Media. **2020**, 59, 930-936	16
726	Tweaking Nickel with Minimal Silver in a Heterogeneous Alloy of Decahedral Geometry to Deliver Platinum-like Hydrogen Evolution Activity. **2020**, 132, 2903-2911	6
725	Mn-Doped RuO2 Nanocrystals as Highly Active Electrocatalysts for Enhanced Oxygen Evolution in Acidic Media. **2020**, 10, 1152-1160	118
724	Tweaking Nickel with Minimal Silver in a Heterogeneous Alloy of Decahedral Geometry to Deliver Platinum-like Hydrogen Evolution Activity. **2020**, 59, 2881-2889	26
723	Identifying Electrocatalytic Sites of the Nanoporous Copper Ruthenium Alloy for Hydrogen Evolution Reaction in Alkaline Electrolyte. **2020**, 5, 192-199	115
722	A General Route to Prepare Low-Ruthenium-Content Bimetallic Electrocatalysts for pH-Universal Hydrogen Evolution Reaction by Using Carbon Quantum Dots. **2020**, 132, 1735-1743	26
721	Integrating Rh Species with NiFe-Layered Double Hydroxide for Overall Water Splitting. **2020**, 20, 136-144	67
720	Metal-Based Nanocatalysts via a Universal Design on Cellular Structure. **2020**, 7, 1902051	41
719	Transition Metal Selenides for Electrocatalytic Hydrogen Evolution Reaction. **2020**, 7, 31-54	46
718	Synergistic effect of ultrafine nano-Ru decorated cobalt carbonate hydroxides nanowires for accelerated alkaline hydrogen evolution reaction. **2020**, 331, 135367	27
717	A General Route to Prepare Low-Ruthenium-Content Bimetallic Electrocatalysts for pH-Universal Hydrogen Evolution Reaction by Using Carbon Quantum Dots. **2020**, 59, 1718-1726	250
716	Electrocatalytic production of hydrogen over highly efficient ultrathin carbon encapsulated S, P co-existence copper nanorods composite. **2020**, 151, 1278-1285	7
715	New Aspects of Platinum Group Metal-Based Solid-Solution Alloy Nanoparticles: Binary to High-Entropy Alloys. **2020**, 26, 5105-5130	19
714	Dual-Metal Interbonding as the Chemical Facilitator for Single-Atom Dispersions. **2020**, 32, e2003484	40
713	A Freestanding 3D Heterostructure Film Stitched by MOF-Derived Carbon Nanotube Microsphere Superstructure and Reduced Graphene Oxide Sheets: A Superior Multifunctional Electrode for Overall Water Splitting and Zn-Air Batteries. **2020**, 32, e2003313	96
712	Defect Engineering of van der Waals Solids for Electrocatalytic Hydrogen Evolution. **2020**, 15, 3682-3695	2

711	Porous Ladder Polymer Networks. **2020**, 6, 2558-2590	10
710	Sponge Assembled by Graphene Nanocages with Double Active Sites to Accelerate Alkaline HER Kinetics. **2020**, 20, 8375-8383	15
709	Ultrasmall Ru Nanoparticles Highly Dispersed on Sulfur-Doped Graphene for HER with High Electrocatalytic Performance. **2020**, 12, 48591-48597	32
708	Host-Guest Thin Films by Confining Ultrafine Pt/C QDs into Metal-Organic Frameworks for Highly Efficient Hydrogen Evolution. **2020**, 16, e2005111	25
707	A two-dimensional h-BN/CN heterostructure as a promising metal-free photocatalyst for overall water-splitting. **2020**, 22, 24446-24454	17
706	A Novel Heterostructure Based on RuMo Nanoalloys and N-doped Carbon as an Efficient Electrocatalyst for the Hydrogen Evolution Reaction. **2020**, 32, e2005433	62
705	Recent progress in noble metal nanocluster and single atom electrocatalysts for the hydrogen evolution reaction. **2020**, 8, 22467-22487	45
704	Robust non-Pt noble metal-based nanomaterials for electrocatalytic hydrogen generation. **2020**, 7, 041304	14
703	Unveiling Single Atom Nucleation for Isolating Ultrafine fcc Ru Nanoclusters with Outstanding Dehydrogenation Activity. **2020**, 10, 2002138	11
702	Recent Progress of Ruthenium-based Nanomaterials for Electrochemical Hydrogen Evolution. **2020** , 7, 4526-4534	8
701	Identifying the Types and Characterization of the Active Sites on M-X-C Single-Atom Catalysts. **2020** , 21, 2486-2496	6
700	Ceria Supported Nickel(0) Nanoparticles: A Highly Active and Low Cost Electrocatalyst for Hydrogen Evolution Reaction. **2020**, 167, 106513	4
699	Controllable synthesis of hollow NiSe2 spheres as an active electrocatalyst for hydrogen evolution reaction. **2020**, 13, 2050033	0
698	Nanosheet-Derived Ultrafine CoRuOx@NC Nanoparticles with a Structure as Bifunctional Electrocatalysts for Electrochemical Water Splitting with High Current Density or Low Power Input. **2020**, 8, 12089-12099	11
697	Binder- free iridium based electrocatalysts: Facile preparation, high activity and outstanding stability for hydrogen evolution reaction in acidic medium. **2020**, 580, 11-20	5
696	Designing a New Efficient Photocatalyst Based on Functionalization of Zn-Infinite Coordination Polymer with Ru(acac) Complex for Dye Degradation in Aqueous Solutions: Charge Separation Effect. **2020**, 36, 14224-14233	7
695	Enhancing electrochemical nitrogen reduction with Ru nanowires via the atomic decoration of Pt. **2020**, 8, 25142-25147	8
694	Electro- and photoelectro-catalysts derived from bimetallic amorphous metal–organic frameworks. **2020**, 10, 8265-8282	5

693	CN: A Class of Covalent Frameworks with Unique Properties. **2020**, 7, 2001767	18
692	On the electronic structure and hydrogen evolution reaction activity of platinum group metal-based high-entropy-alloy nanoparticles. **2020**, 11, 12731-12736	40
691	RuS2-x quantum dots/rGO as bifunctional hydrogen electrocatalysts for harvesting electrochemical neutralization energy. **2020**, 472, 228625	12
690	Self- supported high-entropy alloy electrocatalyst for highly efficient H2 evolution in acid condition. **2020**, 6, 736-742	10
689	Interface Engineering with Ultralow Ruthenium Loading for Efficient Water Splitting. **2020**, 12, 36177-36185	11
688	Molecular engineering of CxNy: Topologies, electronic structures and multidisciplinary applications. **2020**, 31, 3047-3054	25
687	Defect-Rich Copper-doped Ruthenium Hollow Nanoparticles for Efficient Hydrogen Evolution Electrocatalysis in Alkaline Electrolyte. **2020**, 15, 2868-2872	2
686	Photochemically activated atomic ruthenium supported on boron-doped carbon as a robust electrocatalyst for hydrogen evolution. **2020**, 8, 16669-16675	6
685	Ru-Doping Enhanced Electrocatalysis of Metal-Organic Framework Nanosheets toward Overall Water Splitting. **2020**, 26, 17091-17096	16
684	An Efficient RuTe /Graphene Catalyst for Electrochemical Hydrogen Evolution Reaction in Acid Electrolyte. **2020**, 15, 2886-2891	13
683	Bioinspired Construction of Ruthenium-decorated Nitrogen-doped Graphene Aerogel as an Efficient Electrocatalyst for Hydrogen Evolution Reaction. **2020**, 36, 709-714	2
682	Hexagonal Boron Nitride as a Multifunctional Support for Engineering Efficient Electrocatalysts toward the Oxygen Reduction Reaction. **2020**, 20, 6807-6814	50
681	Platinum Atomic Clusters Embedded in Defects of Anatase/Graphene for Efficient Electro- and Photocatalytic Hydrogen Evolution. **2020**, 12, 40204-40212	13
680	2D photocatalysts with tuneable supports for enhanced photocatalytic water splitting. **2020**, 41, 34-43	16
679	Tensile-strained ruthenium phosphide by anion substitution for highly active and durable hydrogen evolution. **2020**, 77, 105212	14
678	Boosting hydrogen and oxygen evolution reactions on electrodeposited nickel electrodes via simultaneous mesoporosity, magnetohydrodynamics and high gradient magnetic force. **2020**, 8, 24782-24799	3
677	CO -Assisted Fabrication of Defect-Engineered Carbon Nitride for Enhanced Electrocatalytic Hydrogen Evolution. **2020**, 15, 4113-4117	3
676	Benchmark Electrocatalysis Activity of 3D-Ni-Co-TiO2 Nanocomposites for Hydrogen Fuel Production Via Alkaline Electrolytes. **2020**, 29, 6940-6951	3

675	Ru-based electrocatalysts for hydrogen evolution reaction:Recent research advances and perspectives. **2020**, 15, 100274	30
674	Nanostructured copper molybdates as promising bifunctional electrocatalysts for overall water splitting and CO reduction.. **2020**, 10, 39037-39048	11
673	Nanoribbon Superstructures of Graphene Nanocages for Efficient Electrocatalytic Hydrogen Evolution. **2020**, 20, 7342-7349	9
672	In situ X-ray diffraction and X-ray absorption spectroscopy of electrocatalysts for energy conversion reactions. **2020**, 8, 19079-19112	39
671	Phosphorus-Induced Activation of Ruthenium for Boosting Hydrogen Oxidation and Evolution Electrocatalysis. **2020**, 10, 11751-11757	52
670	Phase transformation of PiMoCo and their electrocatalytic activity for oxygen evolution reaction. **2020**, 22, 6003-6009	1
669	Coordination engineering of iridium nanocluster bifunctional electrocatalyst for highly efficient and pH-universal overall water splitting. **2020**, 11, 4246	92
668	Enhancing the water splitting performance decorating CoO nanoarrays with ruthenium doping and phosphorization.. **2020**, 10, 27235-27241	3
667	Porphyrinic Metal-Organic Frameworks Derived Carbon-Based Nanomaterials for Hydrogen Evolution Reaction. **2020**, 5, 10988-10995	1
666	Recent Advances in Functional 2D MXene-Based Nanostructures for Next-Generation Devices. **2020**, 30, 2005223	78
665	Transition-Metal Phosphides: Activity Origin, Energy-Related Electrocatalysis Applications, and Synthetic Strategies. **2020**, 30, 2004009	122
664	Computational Screening Single-Atom Catalysts Supported on g-CN for N2 Reduction: High Activity and Selectivity. **2020**, 8, 13749-13758	73
663	2D-organic framework confined metal single atoms with the loading reaching the theoretical limit. **2020**, 7, 2726-2733	9
662	Anion-Modulated Platinum for High-Performance Multifunctional Electrocatalysis toward HER, HOR, and ORR. **2020**, 23, 101793	20
661	A supramolecular-confinement pyrolysis route to ultrasmall rhodium phosphide nanoparticles as a robust electrocatalyst for hydrogen evolution in the entire pH range and seawater electrolysis. **2020**, 8, 25768-25779	10
660	Core-Shell Structured MXene@Carbon Nanodots as Bifunctional Catalysts for Solar-Assisted Water Splitting. **2020**,	28
659	Ru/RuO2 Nanoparticle Composites with N-Doped Reduced Graphene Oxide as Electrocatalysts for Hydrogen and Oxygen Evolution. **2020**, 3, 12269-12277	22
658	Excessive Se on RuSe nanocrystals to accelerate water dissociation for the enhanced electrocatalytic hydrogen evolution reaction. **2020**, 12, 23740-23747	11

657	Single-atom Ru anchored in nitrogen-doped MXene (Ti3C2Tx) as an efficient catalyst for the hydrogen evolution reaction at all pH values. **2020**, 8, 24710-24717	42
656	High-Index Faceted RuCo Nanoscrews for Water Electrosplitting. **2020**, 10, 2002860	27
655	Recent Progress of Carbon-Supported Single-Atom Catalysts for Energy Conversion and Storage. **2020**, 3, 1442-1476	103
654	An Ir/Ni(OH) Heterostructured Electrocatalyst for the Oxygen Evolution Reaction: Breaking the Scaling Relation, Stabilizing Iridium(V), and Beyond. **2020**, 32, e2000872	87
653	Stable Rhodium (IV) Oxide for Alkaline Hydrogen Evolution Reaction. **2020**, 32, e1908521	61
652	Ru Nanoparticles Supported on Co-Embedded N-Doped Carbon Nanotubes as Efficient Electrocatalysts for Hydrogen Evolution in Basic Media. **2020**, 36, 425-430	5
651	Implanting Isolated Ru Atoms into Edge-Rich Carbon Matrix for Efficient Electrocatalytic Hydrogen Evolution. **2020**, 10, 2000882	70
650	Sodium-nickel pyrophosphate as a novel oxygen evolution electrocatalyst in alkaline medium. **2020**, 103, 4748-4753	3
649	Synergistically enhanced hydrogen evolution reaction by ruthenium nanoparticles dispersed on N-doped carbon hollow nanospheres. **2020**, 56, 6802-6805	17
648	Identifying the Transfer Kinetics of Adsorbed Hydroxyl as a Descriptor of Alkaline Hydrogen Evolution Reaction. **2020**, 59, 15232-15237	41
647	A non-carbon catalyst support upgrades the intrinsic activity of ruthenium for hydrogen evolution electrocatalysis via strong interfacial electronic effects. **2020**, 75, 104981	14
646	High Performance Hydrogen Evolution Reaction Catalyst Based on Single-Walled Carbon Nanotubes Decorated by RuOx Nanoparticles. **2020**, 7, 2651-2659	4
645	Sustainable synthesis of supported metal nanocatalysts for electrochemical hydrogen evolution. **2020**, 41, 1791-1811	56
644	Identifying the Transfer Kinetics of Adsorbed Hydroxyl as a Descriptor of Alkaline Hydrogen Evolution Reaction. **2020**, 132, 15344-15349	8
643	Amperometric immunosensor based on covalent organic frameworks and Pt/Ru/C nanoparticles for the quantification of C-reactive protein. **2020**, 187, 320	8
642	Amorphous NiWO4 nanoparticles boosting the alkaline hydrogen evolution performance of Ni3S2 electrocatalysts. **2020**, 274, 119120	46
641	Nitrogen-doped RuS nanoparticles containing reduced Ru as an efficient electrocatalyst for hydrogen evolution.. **2020**, 10, 17862-17868	3
640	Robust ruthenium diphosphide nanoparticles for pH-universal hydrogen evolution reaction with platinum-like activity. **2020**, 274, 119092	40

639	Identifying the electrocatalytic active sites of a Ru-based catalyst with high Faraday efficiency in CO2-saturated media for an aqueous Zn□O2 system. **2020**, 8, 14927-14934	10
638	Electrocatalysis of Single-Atom Sites: Impacts of Atomic Coordination. **2020**, 10, 7584-7618	131
637	Tailoring the ruthenium reactive sites on N doped molybdenum carbide nanosheets via the anti-Ostwald ripening as efficient electrocatalyst for hydrogen evolution reaction in alkaline media. **2020**, 277, 119236	47
636	Cobalt-based heterogeneous catalysts in an electrolyzer system for sustainable energy storage. **2020**, 49, 11430-11450	9
635	Preparation of PtAuFe/C composite catalyst and performance for hydrogen evolution reaction. **2020**, 116, 106765	3
634	pH universal Ru@N-doped carbon catalyst for efficient and fast hydrogen evolution. **2020**, 10, 4405-4411	16
633	Atomically dispersed catalysts for hydrogen/oxygen evolution reactions and overall water splitting. **2020**, 471, 228446	39
632	Discrepant roles of adsorbed OH* species on IrWOx for boosting alkaline hydrogen electrocatalysis. **2020**, 65, 1735-1742	20
631	Recent Studies on Multifunctional Electrocatalysts for Fuel Cell by Various Nanomaterials. **2020**, 10, 621	3
630	Spontaneously separated intermetallic CoMo from nanoporous copper as versatile electrocatalysts for highly efficient water splitting. **2020**, 11, 2940	76
629	Ru Species Supported on MOF-Derived N-Doped TiO2/C Hybrids as Efficient Electrocatalytic/Photocatalytic Hydrogen Evolution Reaction Catalysts. **2020**, 30, 2003007	49
628	Enhancing hydrogen evolution activity of triangular PtPdCu nanodarts by phosphorus incorporation. **2020**, 399, 125810	23
627	Crystal-phase and surface-structure engineering of ruthenium nanocrystals. **2020**, 5, 440-459	58
626	Recent progress in electrode fabrication for electrocatalytic hydrogen evolution reaction: A mini review. **2020**, 393, 124726	62
625	Rhodium/graphitic-carbon-nitride composite electrocatalyst facilitates efficient hydrogen evolution in acidic and alkaline electrolytes. **2020**, 571, 30-37	9
624	Boosting electrochemical water oxidation: the merits of heterostructured electrocatalysts. **2020**, 8, 6393-6405	29
623	Ruthenium Nanoparticles on Cobalt-Doped 1T' Phase MoS Nanosheets for Overall Water Splitting. **2020**, 16, e2000081	41
622	Ruthenium anchored on carbon nanotube electrocatalyst for hydrogen production with enhanced Faradaic efficiency. **2020**, 11, 1278	156

621	Interfacial synergy between dispersed Ru sub-nanoclusters and porous NiFe layered double hydroxide on accelerated overall water splitting by intermediate modulation. **2020**, 12, 9669-9679	30
620	An earth-abundant bimetallic catalyst coated metallic nanowire grown electrode with platinum-like pH-universal hydrogen evolution activity at high current density. **2020**, 11, 3893-3902	30
619	Energy-efficient hydrogen production over a high-performance bifunctional NiMo-based nanorods electrode. **2020**, 571, 48-54	20
618	Synergistically coupling ultrasmall PtCu nanoalloys with highly porous CoP nanosheets as an enhanced electrocatalyst for electrochemical hydrogen evolution. **2020**, 4, 2551-2558	9
617	Double-Solvent Induced Ultrafine Ruthenium Nanoparticles on Porous Carbon for Highly Efficient Hydrogen Evolution Reaction. **2020**, 12, 2880-2885	3
616	Passivated B-O, B-S codoping to improve the photocatalytic efficiency in C2N monolayer: First-principles study. **2020**, 384, 126326	5
615	Surface Engineering on Nickel-Ruthenium Nanoalloys Attached Defective Carbon Sites as Superior Bifunctional Electrocatalysts for Overall Water Splitting. **2020**, 12, 13842-13851	16
614	Two-dimensional amine and hydroxy functionalized fused aromatic covalent organic framework. **2020**, 3,	10
613	Solution-Processable, Crystalline □Conjugated Two-Dimensional Polymers with High Charge Carrier Mobility. **2020**, 6, 2035-2045	23
612	MOF-Derived Sulfide-Based Electrocatalyst and Scaffold for Boosted Hydrogen Production. **2020**, 12, 33595-33602	32
611	Three-Dimensional PdCuRu Alloy Porous Nanosheets as Efficient Electrocatalysts for Hydrogen Evolution Reaction in Varied Electrolytes. **2020**, 7, 3135-3139	3
610	Cobalt phosphide nanoarrays with crystalline-amorphous hybrid phase for hydrogen production in universal-pH. **2020**, 13, 2469-2477	28
609	Ultrafine Ru nanoclusters anchored on cucurbit[6]uril/rGO for efficient hydrogen evolution in a broad pH range. **2020**, 56, 9392-9395	5
608	Robust tuning metal/carbon heterointerfaces via ketonic oxygen enables hydrogen evolution reaction outperforming Pt/C. **2020**, 529, 147080	3
607	Single transition metal atoms anchored on a CN monolayer as efficient catalysts for hydrazine electrooxidation. **2020**, 22, 16691-16700	3
606	Strong synergy in a lichen-like RuCu nanosheet boosts the direct methane oxidation to methanol. **2020**, 71, 104566	25
605	Uncovering near-free platinum single-atom dynamics during electrochemical hydrogen evolution reaction. **2020**, 11, 1029	184
604	Green Synthesis of M0 Nanoparticles (M=Pd, Pt, and Ru) for Electrocatalytic Hydrogen Evolution. **2020**, 60, 630-637	1

603	Metal-free photocatalysts for hydrogen evolution. **2020**, 49, 1887-1931	190
602	Mechanochemical-assisted synthesis of ternary Ru-Ni-S pyrite analogue for enhanced hydrogen evolution performance. **2020**, 162, 172-180	9
601	Topological Engineering of Pt-Group-Metal-Based Chiral Crystals toward High-Efficiency Hydrogen Evolution Catalysts. **2020**, 32, e1908518	35
600	Versatile, Aqueous Soluble CN Quantum Dots with Enriched Active Edges and Oxygenated Groups. **2020**, 142, 4621-4630	24
599	Versatile Route To Fabricate Precious-Metal Phosphide Electrocatalyst for Acid-Stable Hydrogen Oxidation and Evolution Reactions. **2020**, 12, 11737-11744	24
598	Complex cytotoxicity mechanism of bundles formed from self-organised 1-D anodic TiO nanotubes layers. **2020**, 388, 122054	12
597	Platinum Nanoparticle-Deposited Ti3C2Tx MXene for Hydrogen Evolution Reaction. **2020**, 59, 1822-1828	36
596	Strategies for design of electrocatalysts for hydrogen evolution under alkaline conditions. **2020**, 36, 125-138	152
595	Anchoring RuxP on 3D hollow graphene nanospheres as efficient and pH-universal electrocatalysts for the hydrogen evolution reaction. **2020**, 161, 44-50	27
594	Green preparation of Carbon Quantum dots using Gingko biloba to sensitize TiO2 for the photohydrogen production. **2020**, 109, 104945	16
593	A three-dimensional and porous bi-nanospheres electrocatalytic system constructed by in situ generation of Ru nanoclusters inside and outside polydopamine nanoparticles for highly efficient hydrogen evolution reaction. **2020**, 45, 6592-6603	9
592	A 3D Hierarchical Pancake-Like Porous Carbon Nitride for Highly Enhanced Visible-Light Photocatalytic H2 Evolution. **2020**, 10, 77	0
591	Single vs double atom catalyst for N2 activation in nitrogen reduction reaction: A DFT perspective. **2020**, 2, e12014	43
590	Ruthenium doped Ni2P nanosheet arrays for active hydrogen evolution in neutral and alkaline water. **2020**, 4, 1883-1890	7
589	Regulating the electronic configuration of ruthenium nanoparticles via coupling cobalt phosphide for hydrogen evolution in alkaline media. **2020**, 12, 100182	17
588	Boosting the electrocatalytic performance of ultrathin NiP2 nanosheets by synergic effect of W and Ru doping engineering. **2020**, 508, 145302	9
587	Achieving Rich and Active Alkaline Hydrogen Evolution Heterostructures via Interface Engineering on 2D 1T-MoS2 Quantum Sheets. **2020**, 30, 2000551	46
586	A robust and highly active hydrogen evolution catalyst based on Ru nanocrystals supported on vertically oriented Cu nanoplates. **2020**, 8, 10787-10795	8

585	Electron-transfer enhanced MoO2-Ni heterostructures as a highly efficient pH-universal catalyst for hydrogen evolution. **2020**, 63, 841-849	25
584	Establishing Stability in Organic Semiconductor Photocathodes for Solar Hydrogen Production. **2020**, 142, 7795-7802	26
583	Structure and size control of FePtCu nanocatalysts for high performance hydrogen evolution reaction. **2020**, 4, 2727-2733	
582	Revisiting the Limiting Factors for Overall Water-Splitting on Organic Photocatalysts. **2020**, 132, 16418	
581	Revisiting the Limiting Factors for Overall Water-Splitting on Organic Photocatalysts. **2020**, 59, 16278-16293	30
580	Ruthenium Triazine Composite: A Good Match for Increasing Hydrogen Evolution Activity through Contact Electrification. **2020**, 10, 2000067	29
579	Immiscible bi-metal single-atoms driven synthesis of electrocatalysts having superb mass-activity and durability. **2020**, 270, 118896	44
578	Ru2P particles decorated Ni2P nanosheet as efficient and pH-universal material for hydrogen evolution. **2020**, 520, 146363	7
577	Insights into the Electronic Properties and Charge Transfer Mechanism of a Porphyrin Ruthenium-Based Metal□Organic Framework. **2020**, 32, 4194-4204	16
576	Geometric Structure and Electronic Polarization Synergistically Boost Hydrogen Evolution Kinetics in Alkaline Medium. **2020**, 11, 3436-3442	10
575	Ultrafine carbon encapsulated NiRu alloys as bifunctional electrocatalysts for boosting overall water splitting: morphological and electronic modulation through minor Ru alloying. **2020**, 8, 9049-9057	23
574	Highly-dispersed ruthenium precursors a self-assembly-assisted synthesis of uniform ruthenium nanoparticles for superior hydrogen evolution reaction.. **2020**, 10, 14313-14316	5
573	Fe, V-co-doped C2N for electrocatalytic N2-to-NH3 conversion. **2021**, 53, 303-308	23
572	Supported ionic liquid phase-boosted highly active and durable electrocatalysts towards hydrogen evolution reaction in acidic electrolyte. **2021**, 54, 342-351	7
571	Conversion of bimetallic MOF to Ru-doped Cu electrocatalysts for efficient hydrogen evolution in alkaline media. **2021**, 66, 257-264	31
570	The Heterostructure of Ru P/WO /NPC Synergistically Promotes H O Dissociation for Improved Hydrogen Evolution. **2021**, 60, 4110-4116	48
569	Improved hydrogen evolution activity by unique NiS2-MoS2 heterostructures with misfit lattices supported on poly(ionic liquid)s functionalized polypyrrole/graphene oxide nanosheets. **2021**, 404, 126253	11
568	An alternative scheme of biological removal of ammonia nitrogen from wastewater□highly dispersed Ru cluster @mesoporous TiO2 for the catalytic wet air oxidation of low-concentration ammonia. **2021**, 407, 127082	14

567	Recent Progress in Porous Fused Aromatic Networks and Their Applications. **2021**, 1, 2000007	6
566	An efficient ruthenium-based dual-electrocatalyst towards hydrogen evolution and oxygen reduction reactions. **2021**, 16, 100300	5
565	Interface engineering of heterostructured electrocatalysts towards efficient alkaline hydrogen electrocatalysis. **2021**, 66, 85-96	40
564	Atomically dispersed Ni/Ru2P interface sites for high-efficiency pH-universal electrocatalysis of hydrogen evolution. **2021**, 80, 105467	44
563	The Heterostructure of Ru2P/WO3/NPC Synergistically Promotes H2O Dissociation for Improved Hydrogen Evolution. **2021**, 133, 4156-4162	10
562	WOx-Surface Decorated PtNi@Pt Dendritic Nanowires as Efficient pH-Universal Hydrogen Evolution Electrocatalysts. **2021**, 11, 2003192	27
561	A review: Target-oriented transition metal phosphide design and synthesis for water splitting. **2021**, 46, 5131-5149	22
560	RuRh Bimetallene Nanoring as High-efficiency pH-Universal Catalyst for Hydrogen Evolution Reaction. **2021**, 8, 2002341	30
559	Highly Efficient Alkaline Water Splitting with Ru-Doped Co-V Layered Double Hydroxide Nanosheets as a Bifunctional Electrocatalyst. **2021**, 14, 730-737	16
558	Partial-Single-Atom, Partial-Nanoparticle Composites Enhance Water Dissociation for Hydrogen Evolution. **2021**, 8, 2001881	39
557	Structurally ordered intermetallic Ir3V electrocatalysts for alkaline hydrogen evolution reaction. **2021**, 81, 105636	13
556	Integrating NiMoO wafer as a heterogeneous Eurbol for engineering robust Ru-based electrocatalyst for overall water splitting. **2021**, 420, 127686	6
555	Enhanced hydrogen evolution from the face-sharing [RuO6] octahedral motif. **2021**, 56, 276-282	0
554	In-situ generation of Ru-catechol coordinative polymer precursor for high-performance hydrogen evolution reaction doped carbon catalyst. **2021**, 285, 119795	14
553	Spontaneous ruthenium doping in hierarchical flower-like Ni2P/NiO heterostructure nanosheets for superb alkaline hydrogen evolution. **2021**, 417, 128069	7
552	Topological materials and topologically engineered materials: properties, synthesis, and applications for energy conversion and storage. **2021**, 9, 1297-1313	4
551	The rational design of CuSe@(Co,Cu)Se core-shell structures as bifunctional electrocatalysts for neutral-pH overall water splitting. **2021**, 13, 1134-1143	3
550	Atomically dispersed Fe in a C2N Based Catalyst as a Sulfur Host for Efficient Lithium-Sulfur Batteries. **2021**, 11, 2003507	36

549	Radiation synthesis of size-controllable ruthenium-based electrocatalysts for hydrogen evolution reaction. **2021**, 541, 148345	7
548	Ultra-small Sn-RuO2 nanoparticles supported on N-doped carbon polyhedra for highly active and durable oxygen evolution reaction in acidic media. **2021**, 409, 128155	3
547	Carbon nanotube supported PtO nanoparticles with hybrid chemical states for efficient hydrogen evolution. **2021**, 58, 364-369	4
546	Design of hollow carbon-based materials derived from metal□organic frameworks for electrocatalysis and electrochemical energy storage. **2021**, 9, 3880-3917	41
545	Two-Dimensional Metal□Organic Frameworks-Based Electrocatalysts for Oxygen Evolution and Oxygen Reduction Reactions. **2021**, 2, 2000067	12
544	Ruthenium nanodendrites on reduced graphene oxide: an efficient water and 4-nitrophenol reduction catalyst. **2021**, 45, 1556-1564	8
543	A deep eutectic solvent strategy to form defect-rich N, S, and O tridoped carbon/Co9S8 hybrid materials for a pH-universal hydrogen evolution reaction. **2021**, 9, 2099-2103	8
542	Integrating Ru-modulated CoP nanosheets binary co-catalyst with 2D g-CN nanosheets for enhanced photocatalytic hydrogen evolution activity. **2021**, 585, 108-117	27
541	Linker Deficiency, Aromatic Ring Fusion, and Electrocatalysis in a Porous Ni-Pyrazolate Network. **2021**, 60, 161-166	4
540	Ru to W electron donation for boosted HER from acidic to alkaline on Ru/WNO sponges. **2021**, 80, 105531	27
539	Exploiting Ru-Induced Lattice Strain in CoRu Nanoalloys for Robust Bifunctional Hydrogen Production. **2021**, 133, 3327-3335	13
538	Exploiting Ru-Induced Lattice Strain in CoRu Nanoalloys for Robust Bifunctional Hydrogen Production. **2021**, 60, 3290-3298	120
537	Dilute molybdenum atoms embedded in hierarchical nanoporous copper accelerate the hydrogen evolution reaction. **2021**, 191, 56-61	8
536	Novel two-dimensional crystalline carbon nitrides beyond g-C3N4: structure and applications. **2021**, 9, 17-33	29
535	Ultra-small hollow ternary alloy nanoparticles for efficient hydrogen evolution reaction. **2021**, 8, nwaa204	5
534	Low-Load Pt Nanoclusters Anchored on Graphene Hollow Spheres for Efficient Hydrogen Evolution. **2021**, 2, 2000017	27
533	N coupling with S-coordinated Ru nanoclusters for highly efficient hydrogen evolution in alkaline media.	10
532	Ir-based bifunctional electrocatalysts for overall water splitting. **2021**, 11, 4673-4689	10

531	0D ultrafine ruthenium quantum dot decorated 3D porous graphitic carbon nitride with efficient charge separation and appropriate hydrogen adsorption capacity for superior photocatalytic hydrogen evolution. **2021**, 50, 2414-2425	6
530	Alkaline Anion Exchange Membrane (AEM) Water Electrolysers□Current/Future Perspectives in Electrolysers for Hydrogen. **2021**,	
529	Ultrafine CoRu alloy nanoparticles in situ embedded in CoN porous nanosheets as high-efficient hydrogen evolution electrocatalysts. **2021**, 50, 2973-2980	6
528	Ru single atoms and nanoclusters on highly porous N-doped carbon as a hydrogen evolution catalyst in alkaline solutions with ultrahigh mass activity and turnover frequency. **2021**, 9, 12196-12202	8
527	Multi-Scale Design of Metal□Organic Framework-Derived Materials for Energy Electrocatalysis. 2003410	21
526	Sulfur doped ruthenium nanoparticles as a highly efficient electrocatalyst for the hydrogen evolution reaction in alkaline media. **2021**, 11, 3865-3872	1
525	Ultrafine Ru nanoclusters supported on N/S doped macroporous carbon spheres for efficient hydrogen evolution reaction. **2021**, 3, 5068-5074	1
524	Controlled synthesis of ultrasmall RuP2 particles on N,P-codoped carbon as superior pH-wide electrocatalyst for hydrogen evolution. **2021**, 40, 1040-1047	12
523	Organically Capped Iridium Nanoparticles as High-Performance Bifunctional Electrocatalysts for Full Water Splitting in Both Acidic and Alkaline Media: Impacts of Metal□igand Interfacial Interactions. **2021**, 11, 1179-1188	21
522	Promotion of hydrogen evolution catalysis by ordered hierarchically porous electrodes. **2021**, 11, 2997-3001	4
521	Carbon nanopore and anchoring site-assisted general construction of encapsulated metal (Rh, Ru, Ir) nanoclusters for highly efficient hydrogen evolution in pH-universal electrolytes and natural seawater. **2021**, 23, 4551-4559	14
520	Natural DNA-assisted RuP on highly graphitic N,P-codoped carbon for pH-wide hydrogen evolution. **2021**, 57, 7284-7287	2
519	Promoted alkaline hydrogen evolution by an N-doped Pt□Ru single atom alloy. **2021**, 9, 14941-14947	15
518	General fabrication of RuM (M = Ni and Co) nanoclusters for boosting hydrogen evolution reaction electrocatalysis. **2021**, 13, 13042-13047	5
517	Charge pumping enabling Co□NC to outperform benchmark Pt catalyst for pH-universal hydrogen evolution reaction. **2021**, 14, 3160-3173	30
516	A Summary of C2N Theoretical Research on Two-Dimensional Porous Materials. **2021**, 09, 71-79	
515	Partially reduced Ru/RuO2 composites as efficient and pH-universal electrocatalysts for hydrogen evolution.	17
514	Partial sulfur vacancies created by carbon-nitrogen deposition of MoS for high-performance overall electrocatalytic water splitting. **2021**, 13, 14506-14517	6

513	High-performance diluted nickel nanoclusters decorating ruthenium nanowires for pH-universal overall water splitting. **2021**, 14, 3194-3202	19
512	Self-supported hierarchical nanoporous Cu/Mo@MoOx hybrid electrodes as robust nonprecious electrocatalysts for high-efficiency hydrogen evolution. **2021**, 16,	
511	Ultrafine RuP2 nanoparticles supported on nitrogen-doped carbon based on coordination effect for efficient hydrogen evolution. **2021**, 46, 7964-7973	5
510	Benchmarking Phases of Ruthenium Dichalcogenides for Electrocatalysis of Hydrogen Evolution: Theoretical and Experimental Insights. **2021**, 17, e2007333	18
509	CoN/CoMoO Heterostructure as a Highly Active Electrocatalyst for an Alkaline Hydrogen Evolution Reaction. **2021**, 13, 8337-8343	17
508	2D Materials Bridging Experiments and Computations for Electro/Photocatalysis. 2003841	35
507	Ordered Macroporous Superstructure of Nitrogen-Doped Nanoporous Carbon Implanted with Ultrafine Ru Nanoclusters for Efficient pH-Universal Hydrogen Evolution Reaction. **2021**, 33, e2006965	88
506	Active Site Engineering in Transition Metal Based Electrocatalysts for Green Energy Applications. **2021**, 2, 147-158	5
505	In Situ Electrochemical Fabrication of Ultrasmall Ru-Based Nanoparticles for Robust NH Oxidation. **2021**, 13, 8488-8496	1
504	Regenerative fuel cells: Recent progress, challenges, perspectives and their applications for space energy system. **2021**, 283, 116376	14
503	CuFe electrocatalyst for hydrogen evolution reaction in alkaline electrolysis. **2021**, 46, 35886-35886	8
502	Stable and Highly Efficient Hydrogen Evolution from Seawater Enabled by an Unsaturated Nickel Surface Nitride. **2021**, 33, e2007508	81
501	Interfacial engineering of heterogeneous catalysts for electrocatalysis. **2021**, 48, 115-115	15
500	Non-Platinum Group Metal Electrocatalysts toward Efficient Hydrogen Oxidation Reaction. **2021**, 31, 2010633	19
499	Evoking ordered vacancies in metallic nanostructures toward a vacated Barlow packing for high-performance hydrogen evolution. **2021**, 7,	25
498	Exclusive Strain Effect Boosts Overall Water Splitting in PdCu/Ir Core/Shell Nanocrystals. **2021**, 60, 8243-8250	55
497	Li-Ion Intercalated Exfoliated WS2 Nanosheets with Enhanced Electrocatalytic Hydrogen Evolution Performance. **2021**, 56, 2000165	2
496	Rare-Earth Incorporated Alloy Catalysts: Synthesis, Properties, and Applications. **2021**, 33, e2005988	19

495	Phase Control of Noble Monometallic and Alloy Nanomaterials by Chemical Reduction Methods. **2021**, 86, 504-519	2
494	Exclusive Strain Effect Boosts Overall Water Splitting in PdCu/Ir Core/Shell Nanocrystals. **2021**, 133, 8324-8331	1
493	Reversed Active Sites Boost the Intrinsic Activity of Graphene-like Cobalt Selenide for Hydrogen Evolution. **2021**, 133, 12468-12473	3
492	Electronic Optimization by Coupling FeCo Nanoclusters and Pt Nanoparticles to Carbon Nanotubes for Efficient Hydrogen Evolution. **2021**, 9, 5895-5901	4
491	2021 Roadmap: electrocatalysts for green catalytic processes. **2021**, 4, 022004	24
490	Mo-/Co-N-C Hybrid Nanosheets Oriented on Hierarchical Nanoporous Cu as Versatile Electrocatalysts for Efficient Water Splitting. **2021**, 31, 2102285	15
489	High mass-specific reactivity of a defect-enriched Ru electrocatalyst for hydrogen evolution in harsh alkaline and acidic media. **2021**, 64, 2467-2476	3
488	Encapsulation of bimetallic phosphides into graphitized carbon for pH-universal hydrogen evolution reaction. **2021**,	1
487	Ordered clustering of single atomic Te vacancies in atomically thin PtTe promotes hydrogen evolution catalysis. **2021**, 12, 2351	24
486	Paired Ru-O-Mo ensemble for efficient and stable alkaline hydrogen evolution reaction. **2021**, 82, 105767	31
485	Transition Metal/Metal Oxide Interface (Ni/MoO2/Ni4Mo) Stabilized on N-Doped Carbon Paper for Enhanced Hydrogen Evolution Reaction in Alkaline Conditions. **2021**, 60, 5145-5150	6
484	Charge storage behavior and reaction mechanism of α-Fe2O3 as anodes for aqueous batteries. **2021**, 859, 157789	2
483	Graphene-Like Hydrogen-Bonded Melamine-Cyanuric Acid Supramolecular Nanosheets as Pseudo-Porous Catalyst Support. **2021**, 33, e2007368	5
482	Ampere-hour-scale zinc–air pouch cells. **2021**, 6, 592-604	41
481	Recent progress in conjugated microporous polymers for clean energy: Synthesis, modification, computer simulations, and applications. **2021**, 115, 101374	28
480	Rebirth of Ruthenium-Based Nanomaterials for the Hydrogen Evolution Reaction. **2021**, 257-277	
479	Stable Pt atomic clusters on carbon nanotubes grafted with carbon quantum dots as electrocatalyst for H2 evolution in acidic electrolyte.	3
478	Single atom catalyst for electrocatalysis. **2021**, 32, 2947-2947	8

477	Reversed Active Sites Boost the Intrinsic Activity of Graphene-like Cobalt Selenide for Hydrogen Evolution. **2021**, 60, 12360-12365	67
476	Recent Advances in Nanoparticles Confined in Two-Dimensional Materials as High-Performance Electrocatalysts for Energy-Conversion Technologies. **2021**, 13, 2541-2558	1
475	Discovery of Single-Atom Catalyst: Customized Heteroelement Dopants on Graphene. **2021**, 2, 394-406	3
474	Highly dispersed ultra-fine Ru nanoparticles anchored on nitrogen-doped carbon sheets for efficient hydrogen evolution reaction with a low overpotential. **2021**, 864, 158174	2
473	V-doped Ni3N/Ni heterostructure with engineered interfaces as a bifunctional hydrogen electrocatalyst in alkaline solution: Simultaneously improving water dissociation and hydrogen adsorption. **2021**, 14, 3489-3496	9
472	A Self-Supported High-Entropy Metallic Glass with a Nanosponge Architecture for Efficient Hydrogen Evolution under Alkaline and Acidic Conditions. **2021**, 31, 2101586	25
471	Bimetallic ZIF-Derived Co/N-Codoped Porous Carbon Supported Ruthenium Catalysts for Highly Efficient Hydrogen Evolution Reaction. **2021**, 11,	1
470	Electrocatalysts for the hydrogen evolution reaction in alkaline and neutral media. A comparative review. **2021**, 493, 229708	39
469	Unravelling the Role of Strong Metal-Support Interactions in Boosting the Activity toward Hydrogen Evolution Reaction on Ir Nanoparticle/N-Doped Carbon Nanosheet Catalysts. **2021**, 13, 22448-22456	8
468	Is Pt/C More Electrocatalytic than Ru/C for Hydrogen Evolution in Alkaline Electrolytes?. **2021**, 4, 4284-4289	3
467	Electrochemical Catalysts for Green Hydrogen Energy. **2021**, 2, 2100019	2
466	Tuning the Charge Transfer Dynamics of the Nanostructured GaN Photoelectrodes for Efficient Photoelectrochemical Detection in the Ultraviolet Band. **2021**, 31, 2103007	17
465	Atomic-Level Modulation of the Interface Chemistry of Platinum-Nickel Oxide toward Enhanced Hydrogen Electrocatalysis Kinetics. **2021**, 21, 4845-4852	15
464	Manipulating the Coordination Chemistry of Ru?N(O)?C Moieties for Fast Alkaline Hydrogen Evolution Kinetics. **2021**, 31, 2100698	22
463	Exceptional Electrochemical HER Performance with Enhanced Electron Transfer between Ru Nanoparticles and Single Atoms Dispersed on a Carbon Substrate. **2021**, 60, 16044-16050	65
462	Planar-Coordination PdSe2 Nanosheets as Highly Active Electrocatalyst for Hydrogen Evolution Reaction. **2021**, 31, 2102321	56
461	Enhanced hydrogen evolution of single-atom Ru sites via geometric and electronic engineering: N and S dual coordination. **2021**, 551, 148742	13
460	Exceptional Electrochemical HER Performance with Enhanced Electron Transfer between Ru Nanoparticles and Single Atoms Dispersed on a Carbon Substrate. **2021**, 133, 16180-16186	6

459	High-Performance Flow Alkali-Al/Acid Hybrid Fuel Cell for High-Rate H2 Generation. **2021**, 31, 2103248	0
458	Solvent-free microwave synthesis of ultra-small Ru-MoC@CNT with strong metal-support interaction for industrial hydrogen evolution. **2021**, 12, 4018	40
457	Layer-by-Layer Assembly-Based Electrocatalytic Fibril Electrodes Enabling Extremely Low Overpotentials and Stable Operation at 1 A cm2 in Water-Splitting Reaction. **2021**, 31, 2102530	3
456	Highly Desirable Platform for Efficient Hydrogen Generation: Electrodeposited CoP on N-Doped Vertical Graphene. **2021**, 4, 5697-5705	0
455	Recent advances in nanostructured electrocatalysts for hydrogen evolution reaction. **2021**, 40, 3375-3405	18
454	Accelerating water dissociation kinetics of Ni3N by tuning interfacial orbital coupling. **2021**, 14, 3458-3465	6
453	Clean and Affordable Hydrogen Fuel from Alkaline Water Splitting: Past, Recent Progress, and Future Prospects. **2021**, 33, e2007100	144
452	Uniformly Dispersed Ru Nanoparticles Constructed by In Situ Confined Polymerization of Ionic Liquids for the Electrocatalytic Hydrogen Evolution Reaction.. **2021**, 5, e2100505	8
451	Boron Nanosheet-Supported Rh Catalysts for Hydrogen Evolution: A New Territory for the Strong Metal-Support Interaction Effect. **2021**, 13, 138	10
450	Atomic interface engineering: Strawberry-like RuO2/C hybrids for efficient hydrogen evolution from ammonia borane and water. **2021**, 46, 22397-22408	2
449	Engineering local coordination environment of atomically dispersed platinum catalyst via lattice distortion of support for efficient hydrogen evolution reaction. **2021**, 20, 100653	9
448	Modulating interfacial charge distribution of single atoms confined in molybdenum phosphosulfide heterostructures for high efficiency hydrogen evolution. **2021**, 414, 128834	20
447	Hierarchical Architectures Based on Ru Nanoparticles/Oxygen-Rich-Carbon Nanotubes for Efficient Hydrogen Evolution. **2021**, 27, 11150-11157	4
446	Highly Dispersed Pt Nanoparticles Embedded in N-Doped Porous Carbon for Efficient Hydrogen Evolution. **2021**, 16, 1878-1881	4
445	Boosting electrocatalytic activity of Ni2P nanosheets via incorporation of Ru nanoparticles for efficient hydrogen generation in alkaline media. **2021**, 554, 149560	3
444	Engineering the Electronic Interaction between Metals and Carbon Supports for Oxygen/Hydrogen Electrocatalysis. **2021**, 3, 1197-1212	4
443	Ruthenium Nanoparticles Confined in Covalent Organic Framework/Reduced Graphene Oxide As Electrocatalyst toward Hydrogen Evolution Reaction in Alkaline Media. **2021**, 60, 11070-11078	3
442	Engineering Ruthenium-Based Electrocatalysts for Effective Hydrogen Evolution Reaction. **2021**, 13, 160	26

441	Robust crystalline aromatic imide-linked two-dimensional covalent organic frameworks confining ruthenium nanoparticles as efficient hydrogen evolution electrocatalyst. **2021**, 621, 126511	1
440	PdRu/CNTs synthesized by microwave-assisted method for high stable acidic oxygen evolution reaction. e202100111	
439	Plasma-induced moieties impart super-efficient activity to hydrogen evolution electrocatalysts. **2021**, 85, 106030	10
438	Charge redistribution of Ru nanoclusters on Co3O4 porous nanowire via the oxygen regulation for enhanced hydrogen evolution reaction. **2021**, 85, 105940	27
437	Hydrogen Evolution Electrocatalyst Design: Turning Inert Gold into Active Catalyst by Atomically Precise Nanochemistry. **2021**, 143, 11102-11108	21
436	Single boron atom anchored on graphitic carbon nitride nanosheet (B/g-C2N) as a photocatalyst for nitrogen fixation: A first-principles study*. **2021**, 30, 083101	0
435	H 2 O Reduction and Water Splitting Electrocatalytic Cell. **2021**, 91-100	
434	Fused aromatic networks with the different spatial arrangement of structural units. **2021**, 100502	0
433	Supramolecular Anchoring Strategy for Facile Production of Ruthenium Nanoparticles Embedded in N-Doped Mesoporous Carbon Nanospheres for Efficient Hydrogen Generation. **2021**, 13, 32997-33005	1
432	Hollow Ru Nanoparticles for Electrocatalytic Hydrogen Evolution. **2021**, 4, 8530-8538	2
431	Modulating 3d Orbitals of Ni Atoms on Ni-Pt Edge Sites Enables Highly-Efficient Alkaline Hydrogen Evolution. **2021**, 11, 2101789	5
430	MOFs-Derived N-Doped Carbon-Encapsulated Metal/Alloy Electrocatalysts to Tune the Electronic Structure and Reactivity of Carbon Active Sites **2021**, 39, 2626-2637	2
429	Regulating the Coordination Environment of Ruthenium Cluster Catalysts for the Alkaline Hydrogen Evolution Reaction. **2021**, 12, 8016-8023	6
428	Theoretical screening of 2D materials supported transition-metal single atoms as efficient electrocatalysts for hydrogen evolution reaction. **2021**, 18, 101168	0
427	NbSe2 Meets C2N: A 2D-2D Heterostructure Catalysts as Multifunctional Polysulfide Mediator in Ultra-Long-Life LithiumSulfur Batteries. **2021**, 11, 2101250	18
426	Activating interfacial S sites of MoS2 boosts hydrogen evolution electrocatalysis. 1	21
425	Highly Dispersed Ru Nanoparticles on Boron-Doped Ti C T (MXene) Nanosheets for Synergistic Enhancement of Electrocatalytic Hydrogen Evolution. **2021**, 17, e2102218	12
424	Integrating RuNi alloy in S-doped defective carbon for efficient hydrogen evolution in both acidic and alkaline media. **2021**, 417, 129319	8

423	Tuning the oxidation state of Ru to surpass Pt in hydrogen evolution reaction. **2021**, 14, 4321	3
422	Ru-Co-Mn trimetallic alloy nanocatalyst driving bifunctional redox electrocatalysis. 1	4
421	Theoretical design of ruthenium single-atom catalysts with different substrates for acetylene hydrochlorination. **2021**, 513, 111826	1
420	Atomic level engineering of noble metal nanocrystals for energy conversion catalysis. **2021**, 63, 604-604	1
419	In Situ Evolution of Ru4Al13 Crystals into a Highly Active Catalyst for the Hydrogen Evolution Reaction. **2021**, 33, 7124-7131	4
418	Interfacial optimization of PtNi octahedrons@Ti3C2MXene with enhanced alkaline hydrogen evolution activity and stability. **2021**, 291, 120100	21
417	Multi-Sites Electrocatalysis in High-Entropy Alloys. **2021**, 31, 2106715	17
416	Ruthenium nanoparticles supported on carbon oxide nanotubes for electrocatalytic hydrogen evolution in alkaline media. **2021**, 779, 138879	2
415	Strong Electron Coupling of Ru and Vacancy-Rich Carbon Dots for Synergistically Enhanced Hydrogen Evolution Reaction. **2021**, 17, e2102496	5
414	An overview of the active sites in transition metal electrocatalysts and their practical activity for hydrogen evolution reaction. **2021**, 430, 132312	2
413	Hierarchical Nanostructured Co-Mo-B/CoMoO Amorphous Composite for the Alkaline Hydrogen Evolution Reaction. **2021**, 13, 42605-42612	3
412	Ru2P nanofibers for high-performance anion exchange membrane water electrolyzer. **2021**, 420, 130491	5
411	Electronic Modulation Caused by Interfacial Ni-O-M (M=Ru, Ir, Pd) Bonding for Accelerating Hydrogen Evolution Kinetics. **2021**, 60, 22276-22282	37
410	The promise of hydrogen production from alkaline anion exchange membrane electrolyzers. **2021**, 87, 106162	34
409	Computational Studies on Carbon Dots Electrocatalysis: A Review. 2107196	13
408	Inside solid-liquid interfaces: Understanding the influence of the electrical double layer on alkaline hydrogen evolution reaction. **2021**, 293, 120220	13
407	Heterojunction-based electron donators to stabilize and activate ultrafine Pt nanoparticles for efficient hydrogen atom dissociation and gas evolution.	1
406	Ruthenium decorated 2D N-doped carbon nanocone arrays for pH-universal electrocatalytic hydrogen evolution. **2021**, 559, 149978	2

405	Bifunctional heterostructured nitrogen and phosphorus co-doped carbon-layer-encapsulated Co2P electrocatalyst for efficient water splitting. **2021**, 2, 100586	0
404	Synergistic effect in ultrafine PtNiP nanowires for highly efficient electrochemical hydrogen evolution in alkaline electrolyte. **2021**, 301, 120754	12
403	Electronic Modulation Caused by Interfacial Ni-O-M (M=Ru, Ir, Pd) Bonding for Accelerating Hydrogen Evolution Kinetics. **2021**, 133, 22450-22456	12
402	Sub-2 nm Ultrasmall High-Entropy Alloy Nanoparticles for Extremely Superior Electrocatalytic Hydrogen Evolution. **2021**, 143, 17117-17127	27
401	Engineering MoTe2 and Janus SeMoTe nanosheet structures: First-principles roadmap and practical uses in hydrogen evolution reactions and symmetric supercapacitors. **2021**, 87, 106161	13
400	Trace Oxophilic Metal Induced Surface Reconstruction at Buried RuRh Cluster Interfaces Possesses Extremely Fast Hydrogen Redox Kinetics. **2021**, 90, 106579	9
399	Heterojunction-Based Electron Donators to Stabilize and Activate Ultrafine Pt Nanoparticles for Efficient Hydrogen Atom Dissociation and Gas Evolution. **2021**, 60, 25766-25770	5
398	Engineering the synergistic effect of carbon dots-stabilized atomic and subnanometric ruthenium as highly efficient electrocatalysts for robust hydrogen evolution.	2
397	Metal-Free Triazine-Based 2D Covalent Organic Framework for Efficient H Evolution by Electrochemical Water Splitting. **2021**, 14, 5057-5064	5
396	Graphdiyne in-situ thermal reduction enabled ultra-small quasi-core/shell Ru-RuO2 heterostructures for efficient acidic water oxidation. **2021**, 8, 044011	1
395	Exposing highly active (100) facet on a SnS2/SnO2 electrocatalyst to boost efficient hydrogen evolution. **2021**, 292, 120200	17
394	Atomically Isolated Rh Sites within Highly Branched Rh Sb Nanostructures Enhance Bifunctional Hydrogen Electrocatalysis. **2021**, 33, e2105049	8
393	Photoinduced charge transfer in one-photon and two-photon absorption of C2N: Effects of edge-modified with oxygenated groups. **2021**, 778, 138810	1
392	Realization of interstitial boron ordering and optimal near-surface electronic structure in Pd-B alloy electrocatalysts. **2021**, 419, 129568	10
391	Enhanced hydrogen evolution reaction activity of FeM (M□=□Pt, Pd, Ru, Rh) nanoparticles with N-doped carbon coatings over a wide-pH environment. **2021**, 514, 111830	1
390	Nanoblackberries of {WFe} and {MoFe}: Electrocatalytic Water Reduction. **2021**, 60, 15569-15582	0
389	Mesoporous carbon-supported ultrasmall metal nanoparticles via a mechanochemical-driven redox reaction: A □Two-in-One□ strategy. **2021**, 294, 120232	2
388	MOF-derived NiCoZnP nanoclusters anchored on hierarchical N-doped carbon nanosheets array as bifunctional electrocatalysts for overall water splitting. **2021**, 422, 130533	16

387	Nano-engineering of Ru-based hierarchical porous nanoreactors for highly efficient pH-universal overall water splitting. **2021**, 294, 120230	14
386	Implanting Ru nanoclusters into N-doped graphene for efficient alkaline hydrogen evolution. **2021**, 183, 362-367	3
385	Ru nanoparticles supported on partially reduced TiO2 as highly efficient catalyst for hydrogen evolution. **2021**, 88, 106211	10
384	State of the art two-dimensional covalent organic frameworks: Prospects from rational design and reactions to applications for advanced energy storage technologies. **2021**, 447, 214152	17
383	Addressing electrocatalytic activity and stability of LnBaCo2O5+ perovskites for hydrogen evolution reaction by structural and electronic features. **2021**, 297, 120403	8
382	Synthesis of Al doped CoP2/rGO composite and its high electrocatalytic activity for hydrogen evolution reaction. **2021**, 303, 122552	1
381	Nickel-cobalt phosphate nanoparticles wrapped in nitrogen-doped carbon loading on partially phosphatized foamed nickel as efficient electrocatalyst for water splitting. **2021**, 426, 130854	6
380	Understanding reaction mechanism of oxygen evolution reaction using Ru single atoms as catalyst for Li-O2 battery. **2021**, 886, 161189	6
379	Evolution of interfacial coupling interaction of Ni-Ru species for pH-universal water splitting. **2021**, 426, 130762	8
378	Inter-doped ruthenium–nickel oxide heterostructure nanosheets with dual active centers for electrochemical-/solar-driven overall water splitting. **2021**, 298, 120611	10
377	Preparation and application of 0D-2D nanomaterial hybrid heterostructures for energy applications. **2021**, 12, 100169	5
376	Stone-Wales defect-rich carbon-supported dual-metal single atom sites for Zn-air batteries. **2021**, 90, 106488	9
375	Identification of single-atom-anchored g-CN as pH universal photo- and electro- catalysts for hydrogen evolution. **2021**, 25, 101177	1
374	Ga doping enables superior alkaline hydrogen evolution reaction performances of CoP. **2022**, 429, 132012	8
373	Accelerating water reduction towards hydrogen generation via cluster size adjustment in Ru-incorporated carbon nitride. **2022**, 429, 132282	5
372	Advanced hydrogen evolution electrocatalysis enabled by ruthenium phosphide with tailored hydrogen binding strength via interfacial electronic interaction. **2022**, 429, 132557	3
371	PtRu alloy nanoparticles embedded on C2N nanosheets for efficient hydrogen evolution reaction in both acidic and alkaline solutions. **2022**, 428, 131085	3
370	Fragment-interconnected nitrogen-doped porous carbon nanosheets loaded with platinum group metals for highly boosted hydrogen evolution reaction in alkaline solution. **2022**, 605, 528-536	0

369	Atom-level interfacial synergy of single-atom site catalysts for electrocatalysis. **2022**, 65, 103-115	10
368	Ultralow loading of ruthenium nanoparticles on nitrogen-doped porous carbon enables ultrahigh mass activity for the hydrogen evolution reaction in alkaline media. **2021**, 11, 3182-3188	4
367	A rigorous electrochemical ammonia electrolysis protocol with in operando quantitative analysis. **2021**, 9, 11571-11579	4
366	Single-atom catalysts for high-energy rechargeable batteries. **2021**, 12, 7656-7676	18
365	Boosting the water dissociation kinetics via charge redistribution of ruthenium decorated on S, N-codoped carbon. **2021**, 9, 16967-16973	3
364	Fused Aromatic Network with Exceptionally High Carrier Mobility. **2021**, 33, e2004707	6
363	Recent advances in the metal-organic framework-based electrocatalysts for the hydrogen evolution reaction in water splitting: a review.. **2021**, 11, 21904-21925	16
362	Ar/H2/O2-Controlled Growth Thermodynamics and Kinetics to Create Zero-, One-, and Two-Dimensional Ruthenium Nanocrystals towards Acidic Overall Water Splitting. **2021**, 31, 2007344	6
361	Tuning metal single atoms embedded in NxCy moieties toward high-performance electrocatalysis. **2021**, 14, 3455-3468	47
360	Recent advances of graphdiyne: synthesis, functionalization, and electrocatalytic applications.	2
359	Nanoscale electrocatalyst design for alkaline hydrogen evolution reaction through activity descriptor identification. **2021**, 5, 4042-4058	1
358	Oxygen-deficient TiO2 and carbon coupling synergistically boost the activity of Ru nanoparticles for the alkaline hydrogen evolution reaction. **2021**, 9, 10160-10168	6
357	Electrochemical hydrogen evolution reaction efficiently catalyzed by Ru□N coupling in defect-rich Ru/g-C3N4 nanosheets. **2021**, 9, 15019-15026	9
356	Hydrogen generation from ammonia borane hydrolysis catalyzed by ruthenium nanoparticles supported on Co□Ni layered double oxides. **2021**, 5, 2301-2312	6
355	Regulating the Interfacial Electronic Coupling of Fe N via Orbital Steering for Hydrogen Evolution Catalysis. **2020**, 32, e1904346	48
354	Greatly boosting electrochemical hydrogen evolution reaction over Ni3S2 nanosheets rationally decorated by Ni3Sn2S2 quantum dots. **2020**, 267, 118675	38
353	Multiple-interface relay catalysis: Enhancing alkaline hydrogen evolution through a combination of Volmer promoter and electrical-behavior regulation. **2020**, 397, 125457	18
352	3D porous flower-like heterostructure of Fe doped Ni2P nanoparticles anchored on Al2O3 nanosheets as an ultrastable high-efficiency electrocatalyst. **2020**, 349, 136417	12

351	Boron-rich environment boosting ruthenium boride on B, N doped carbon outperforms platinum for hydrogen evolution reaction in a universal pH range. **2020**, 75, 104881	43
350	Edge-selective decoration with ruthenium at graphitic nanoplatelets for efficient hydrogen production at universal pH. **2020**, 76, 105114	11
349	Compressed Intermetallic PdCu for Enhanced Electrocatalysis. **2020**, 5, 3672-3680	19
348	Recent advancement in the electrocatalytic synthesis of ammonia. **2020**, 12, 8065-8094	19
347	Design and simulation of C2N based solar cell by SCAPS-1D software. **2020**, 7, 126303	7
346	Weakened lattice-strain effect in MoOx@NPC-supported ruthenium dots toward high-efficiency hydrogen generation.	2
345	Crystal Phase Transition Creates a Highly Active and Stable RuC Nanosurface for Hydrogen Evolution Reaction in Alkaline Media. **2021**, 33, e2105248	7
344	Metal-Free Z-Scheme aza-CMP/C2N Heterostructure to Facilitate Photocatalytic CO2 Reduction: A Computational Study. **2021**, 125, 23133-23141	0
343	Synergistic Electrocatalysts for Alkaline Hydrogen Oxidation and Evolution Reactions. 2107479	13
342	Synergistic Cascade Hydrogen Evolution Boosting via Integrating Surface Oxophilicity Modification with Carbon Layer Confinement. 2108991	8
341	On the Durability of Iridium-Based Electrocatalysts toward the Oxygen Evolution Reaction under Acid Environment. 2108465	8
340	Spontaneous amorphous oxide-interfaced ultrafine noble metal nanoclusters for unexpected anodic electrocatalysis. **2021**, 1, 1104-1117	4
339	3D Porous Fused Aromatic Networks for High Performance Gas and Iodine Uptakes. **2021**, 8, 2101373	0
338	Near-Equilibrium Growth of Chemically Stable Covalent Organic Framework/Graphene Oxide Hybrid Materials for the Hydrogen Evolution Reaction.	1
337	Electronic coupling induced by structural deformation and magnetic dopants in dual-metal Janus MoReS3 and WReS3 for hydrogen evolution reaction. **2021**, 785, 139120	
336	Rational design of Ru aerogel and RuCo aerogels with abundant oxygen vacancies for hydrogen evolution reaction, oxygen evolution reaction, and overall water splitting. **2021**, 514, 230600	4
335	Roles of Coordination Geometry in Single-Atom Catalysts. **2020**, 37-76	2
334	Superstructures of Organic-Polyoxometalate co-Crystals as Precursors for Hydrogen Evolution Electrocatalysts.	

333	Functional Grain Boundaries in Two-Dimensional Transition-Metal Dichalcogenides. **2021**, 54, 4191-4202	2
332	Near-Equilibrium Growth of Chemically Stable Covalent Organic Framework/Graphene Oxide Hybrid Materials for the Hydrogen Evolution Reaction. **2021**,	3
331	Low temperature activation of inert hexagonal boron nitride for metal deposition and single atom catalysis. **2021**,	5
330	Superstructures of Organic-Polyoxometalate Co-crystals as Precursors for Hydrogen Evolution Electrocatalysts. **2021**,	3
329	Rapid microwave synthesis of Ru-supported partially carbonized conductive metal□organic framework for efficient hydrogen evolution. **2021**, 431, 133247	1
328	Amorphous aerogel of trimetallic FeCoNi alloy for highly efficient oxygen evolution. **2022**, 430, 132955	7
327	Bifunctional nanocatalysts for water splitting and its challenges. **2020**, 59-95	
326	Intermetallic CuZr Clusters Anchored on Hierarchical Nanoporous Copper as Efficient Catalysts for Hydrogen Evolution Reaction. **2020**, 2020, 2987234	11
325	Interface engineering and anion engineering of Mo-based heterogeneous electrocatalysts for hydrogen evolution reaction.	0
324	A WOx mediated interface boosts the activity and stability of Pt-catalyst for alkaline water splitting. **2021**, 133287	1
323	Nanoscale electrodeposition: Dimension control and 3D conformality. 20210012	7
322	Oxygen Vacancy Engineering Synergistic with Surface Hydrophilicity Modification of Hollow Ru Doped CoNi-LDH Nanotube Arrays for Boosting Hydrogen Evolution. **2021**, e2104323	9
321	Nanostructured Ruthenium Oxide for Electrocatalysis of Hydrogen Evolution Reaction in Aqueous Alkaline Solutions. **2020**, 15, 730-734	
320	Mechanistic understanding and design of non-noble metal-based single-atom catalysts supported on two-dimensional materials for CO2 electroreduction.	2
319	Amorphous Ru nanoclusters onto Co-doped 1D carbon nanocages enables efficient hydrogen evolution catalysis. **2022**, 43, 110-115	3
318	Interface Catalysis of Nickel Molybdenum (NiMo) Alloys on Two-Dimensional (2D) MXene for Enhanced Hydrogen Electrochemistry. **2021**, 12, 11361-11370	1
317	Redispersed Bi nanoparticles on graphene fiber fabric anode regulated by microwave irradiation for flexible sodium ion capacitors. **2021**, 433, 133521	4
316	Phase control and stabilization of 1T-MoS2 via black TiO2□ nanotube arrays supporting for electrocatalytic hydrogen evolution. **2021**, 68, 71-71	3

315	Fused aromatic networks as a new class of gas hydrate inhibitors. **2021**, 133691	2
314	Rapid and large-scale synthesis of ultra-small immiscible alloy supported catalysts. **2021**, 120916	4
313	High-density ultrafine RuP2 with strong catalyst-support interaction driven by dual-ligand and tungsten-oxygen sites for hydrogen evolution at 1 A cm□. **2021**, 304, 120917	1
312	Atomically Dispersed, Low-Coordinate Co-N Sites on Carbon Nanotubes as Inexpensive and Efficient Electrocatalysts for Hydrogen Evolution. **2021**, e2105335	5
311	Atomic Disorder Enables Superior Catalytic Surface of Pt-Based Catalysts for Alkaline Hydrogen Evolution. 1738-1745	1
310	Confining Zero-Valent Platinum Single Atoms in □MoC1□ for pH-Universal Hydrogen Evolution Reaction. 2108464	5
309	Nanoconfinement Effects of Ni@CNT for Efficient Electrocatalytic Oxygen Reduction and Evolution Reaction.	
308	SILD-preparation of nanostructured Ru0x-RuO2□nH2O thin films: Effect of deposition cycles on electrocatalytic properties. **2022**,	
307	Cutting COF-like C4N into Colloidal Quantum Dots toward Optical Encryption and Bidirectional Sulfur Chemistry via Functional Group and Edge Effects. **2021**, e202114182	1
306	Cutting COF-like C 4 N to Give Colloidal Quantum Dots: Towards Optical Encryption and Bidirectional Sulfur Chemistry via Functional Group and Edge Effects.	
305	Ruthenium-based graphene-like layered carbon compos-ites as high-efficiency electrocatalyst for hydrogen evolu-tion reaction. **2022**, 789, 139324	
304	Nanoconfinement effects of Ni@CNT for efficient electrocatalytic oxygen reduction and evolution reaction. **2022**, 897, 163206	0
303	Zn-VOx-Co nanosheets with amorphous/crystalline heterostructure for highly efficient hydrogen evolution reaction. **2022**, 432, 134329	1
302	Unveiling the critical role of active site interaction in single atom catalyst towards hydrogen evolution catalysis. **2022**, 93, 106819	3
301	Ru-substituted Co nanoalloys encapsulated within graphene as efficient electrocatalysts for accelerating water dissociation in alkaline solution. **2022**, 580, 152294	0
300	Flower-like CeO2-supported small-sized Ru nanoparticle hybrids for highly efficient alkaline hydrogen evolution: Roles of interfacial effects. **2022**, 581, 152256	2
299	Achieving highly efficient pH-universal hydrogen evolution by superhydrophilic amorphous/crystalline Rh(OH)3/NiTe coaxial nanorod array electrode. **2022**, 305, 121088	8
298	Metal-organic frameworks derived RuP2 with yolk-shell structure and efficient performance for hydrogen evolution reaction in both acidic and alkaline media. **2022**, 305, 121043	4

297	Highly Efficient Oxygen-Modulated Ru-Based HER Electrocatalyst in a Wide pH Range. **2022**, 9,	0
296	Unraveling the Function of Metal□Amorphous Support Interactions in Single-Atom Electrocatalytic Hydrogen Evolution.	
295	Fluoride-incorporated cobalt-based electrocatalyst towards enhanced hydrogen evolution reaction.. **2022**,	0
294	Activating the oxygen electrocatalytic activity of layer-structured CaCoO nanofibers by iron doping.. **2022**,	
293	Emerging interstitial/substitutional modification of Pd-based nanomaterials with nonmetallic elements for electrocatalytic applications.. **2022**,	2
292	Mo2C@C nanofibers film as durable self-supported electrode for efficient electrocatalytic hydrogen evolution.. **2022**,	2
291	Unraveling the Function of Metal-Amorphous Support Interactions in Single-Atom Electrocatalytic Hydrogen Evolution.. **2021**,	6
290	Laser-assisted high-performance PtRu alloy for pH-universal hydrogen evolution. **2022**, 15, 102-108	5
289	Advances of the functionalized carbon nitrides for electrocatalysis.	0
288	Tunable Ru-Ru 2 P heterostructures with charge redistribution for efficient pH-universal hydrogen evolution.	7
287	Increased crystallinity of RuSe/carbon nanotubes for enhanced electrochemical hydrogen generation performance.. **2021**,	1
286	Recent advances in non-precious group metal-based catalysts for water electrolysis and beyond. **2021**, 10, 50-88	4
285	Electrochemical Hydrogen Evolution Reaction. **2022**, 87-122	
284	Enhancing the photocatalytic hydrogen generation performance and strain regulation of the vertical GeI2/C2N van der Waals heterostructure: insights from first-principles study.	1
283	A multifunctional cobalt iron sulfide electrocatalyst for high performance Zn□air batteries and overall water splitting.	1
282	One-step integration of amorphous RuBx and crystalline Ru nanoparticles into B/N-doped porous carbon polyhedra for robust electrocatalytic activity towards the HER in both acidic and basic media.	2
281	Ultrafine MoC nanoparticles embedded in an MOF derived N and P co-doped carbon matrix for an efficient electrocatalytic oxygen reduction reaction in zinc-air batteries.. **2022**,	1
280	Highly efficient hydrogen production via a zinc-carbon @ nickel system. **2022**, 47, 5354-5360	0

279	Two-dimensional B7P2: Dual-purpose functional material for hydrogen evolution reaction/hydrogen storage. **2022**, 47, 8338-8347	0
278	Confinement synthesis in porous molecule-based materials: a new opportunity for ultrafine nanostructures.. **2022**, 13, 1569-1593	1
277	Bridge the activity and durability of Ruthenium for hydrogen evolution reaction with the RuOC link. **2022**, 433, 134421	4
276	Re nanoclusters anchored on nanosheet supports: Formation of Re-O-matrix bonding and evaluation as all-pH-range hydrogen evolution reaction (HER) electrocatalysts. **2022**, 69, 185-193	1
275	Pt-Co single atom alloy catalysts: Accelerated water dissociation and hydrogen evolution by strain regulation. **2022**, 69, 44-53	2
274	Noble-metal-based high-entropy-alloy nanoparticles for electrocatalysis. **2022**, 68, 721-751	2
273	Au(111)@TiO heterostructure composites with enhanced synergistic effects as efficient electrocatalysts for the hydrogen evolution reaction.. **2022**,	0
272	Construction of single-atom catalysts for electro-, photo- and photoelectro-catalytic applications: State-of-the-art, opportunities, and challenges. **2022**,	5
271	Ru-incorporated oxygen-vacancy-enriched MoO2 electrocatalysts for hydrogen evolution reaction. **2022**, 307, 121204	8
270	Tuning charge distribution of Ru nanoparticles via coupling ammonium tungsten bronze as Pt-Like electrocatalyst for hydrogen evolution reaction. **2022**, 436, 135044	1
269	RuP Nanoparticles Supported on N, O Codoped Porous Hollow Carbon for Efficient Hydrogen Oxidation Reaction. 2102193	2
268	Boron-Tethering and Regulative Electronic States Around Iridium Species for Hydrogen Evolution. 2113191	5
267	Spherical vs. planar: Steering the electronic communication between Ru nanoparticle and single atom to boost the electrocatalytic hydrogen evolution activity both in acid and alkaline. **2022**, 307, 121193	3
266	Combined anodic and cathodic hydrogen production from aldehyde oxidation and hydrogen evolution reaction. **2022**, 5, 66-73	29
265	Tuning Charge Distribution of Ru Nanoparticles Via Coupling Ammonium Tungsten Bronze as Pt-Like Electrocatalyst for Hydrogen Evolution Reaction.	
264	The volcanic relationship between the HER activity and lattice constant of RuCo alloy nanofilms.. **2022**,	0
263	Encapsulated RuP-RuS nanoheterostructure with regulated interfacial charge redistribution for synergistically boosting hydrogen evolution electrocatalysis.. **2022**,	0
262	Interfacial Nanobubbles' Growth at the Initial Stage of Electrocatalytic Hydrogen Evolution.	

261	Low temperature catalytic hydrodeoxygenation of lignin-derived phenols to cyclohexanols over the Ru/SBA-15 catalyst.. **2022**, 12, 9352-9362	1
260	Engineering the Electronic Structure of Submonolayer Pt on Intermetallic Pd3Pb via Charge Transfer Boosts the Hydrogen Evolution Reaction. **2022**, 93-116	1
259	Highly efficient catalysts of ruthenium clusters on Fe3O4/MWCNTs for the hydrogen evolution reaction.	1
258	Single-, double-, and triple-atom catalysts on graphene-like C2N enable electrocatalytic nitrogen reduction: insight from first principles.	2
257	Hydrogen Evolution Reaction Activity Obtained Using Platinum Single Atoms on Tio2 Nanosheets Modified with Graphene.	
256	Triggering Electronic Coupling between Neighbouring Hetero-Diatomic Metal Sites Promotes Hydrogen Evolution Reaction Kinetics.	
255	N-doping induced lattice-strained porous PdIr bimetallene for pH-universal hydrogen evolution electrocatalysis.	2
254	A tetra Co(II/III) complex with an open cubane CoO core and square-pyramidal Co(II) and octahedral Co(III) centres: bifunctional electrocatalytic activity towards water splitting at neutral pH.. **2022**,	3
253	Two-Dimensional High-Entropy Metal Phosphorus Trichalcogenides for Enhanced Hydrogen Evolution Reaction.. **2022**,	9
252	Single Crystals of □MoO-Intercalated {Ni(HO)} and Electrocatalytic Water Reduction: Toward a Class of Molybdenum Bronzes.. **2022**,	0
251	Nanoengineered, Mo-Doped, Ni3S2 Electrocatalyst with Increased Ni□ Coordination for Oxygen Evolution in Alkaline Seawater. **2022**, 36, 2910-2917	1
250	Ultrahigh Pt-Mass-Activity Hydrogen Evolution Catalyst Electrodeposited from Bulk Pt. 2112207	8
249	Crystal Structure Control of Binary and Ternary Solid-Solution Alloy Nanoparticles with a Face-Centered Cubic or Hexagonal Close-Packed Phase.. **2022**,	4
248	Reversing the Nucleophilicity of Active Sites in CoP Enables Exceptional Hydrogen Evolution Catalysis.. **2022**, e2106870	5
247	Quasi zero-dimensional MoS2 quantum dots decorated 2D Ti3C2Tx MXene as advanced electrocatalysts for hydrogen evolution reaction. **2022**, 47, 10583-10593	1
246	Identification of Catalytic Active Sites for Durable Proton Exchange Membrane Fuel Cell: Catalytic Degradation and Poisoning Perspectives.. **2022**, e2106279	4
245	Synergetic Function of the Single-Atom Ru-N Site and Ru Nanoparticles for Hydrogen Production in a Wide pH Range and Seawater Electrolysis.. **2022**,	6
244	Searching for an Optimal Multi-metallic Alloy Catalyst by Active Learning Combined with Experiments.. **2022**, e2108900	2

243	Biodiversity Benefits for Size Modulation of Metal Nanoparticles to Achieve In Situ Semi-Oxidation toward Optimized Electrocatalytic Oxygen Evolution. 2202119	1
242	Interstitial boron-triggered electron-deficient Os aerogels for enhanced pH-universal hydrogen evolution.. **2022**, 13, 1143	16
241	Hydrogen spillover in complex oxide multifunctional sites improves acidic hydrogen evolution electrocatalysis.. **2022**, 13, 1189	12
240	Doping Ruthenium into Metal Matrix for Promoted pH-Universal Hydrogen Evolution.. **2022**, e2200010	5
239	Boosting Electrocatalytic Activity of Ru for Acidic Hydrogen Evolution through Hydrogen Spillover Strategy. **2022**, 7, 1330-1337	4
238	Wet Treatment of Ni-Containing Electroplating Wastewater Doped with Fe and Co as a Hydrogen Evolution Catalyst. **2022**, 36, 4107-4117	
237	Conversion of Catalytically Inert 2D Bismuth Oxide Nanosheets for Effective Electrochemical Hydrogen Evolution Reaction Catalysis via Oxygen Vacancy Concentration Modulation.. **2022**, 14, 90	10
236	From Fundamentals and Theories to Heterostructured Electrocatalyst Design: An In-depth Understanding of Alkaline Hydrogen Evolution Reaction. **2022**, 107231	7
235	Ru/graphene hybrid film catalyst for NaBH4 hydrolysis reaction. **2022**,	0
234	Toward enhanced alkaline hydrogen electrocatalysis with transition metal-functionalized nitrogen-doped carbon supports. **2022**, 43, 1351-1359	1
233	Boron-induced activation of Ru nanoparticles anchored on carbon nanotubes for the enhanced pH-independent hydrogen evolution reaction.. **2022**, 616, 338-346	1
232	A facile approach to tailor electrocatalytic properties of MnO2 through tuning phase transition, surface morphology and band structure. **2022**, 438, 135561	3
231	High-entropy phosphate/C hybrid nanosheets for efficient acidic hydrogen evolution reaction. **2022** , 437, 135375	1
230	Selective surface deposition of trace amount of ruthenium onto a freestanding, fibrous carbon monolith for pH-universal hydrogen evolution reaction. **2022**, 437, 135322	1
229	Atomic ruthenium coordinated with chlorine and nitrogen as efficient and multifunctional electrocatalyst for overall water splitting and rechargeable zinc-air battery. **2022**, 441, 136078	3
228	Single-atom Ir and Ru anchored on graphitic carbon nitride for efficient and stable electrocatalytic/photocatalytic hydrogen evolution. **2022**, 310, 121318	3
227	Electrochemically Fabricated Surface-Mesostructured CuNi Bimetallic Catalysts for Hydrogen Production in Alkaline Media.. **2021**, 12,	1
226	Corrosive-coordinate engineering to construct 2D-3D nanostructure with trace Pt as efficient bifunctional electrocatalyst for overall water splitting. **2022**, 65, 1217-1224	3

225	References. **2021**, 317-358	
224	Cobalt on boron-doped carbon nitride for a novel bifunctional electrocatalyst in zinc-air batteries.	1
223	Nanocatalytic Materials for Energy-Related Small-Molecules Conversions: Active Site Design, Identification and Structure-Performance Relationship Discovery.. **2021**,	2
222	Modulation of the thermal conductivity, interlayer thermal resistance, and interfacial thermal conductance of CN.. **2022**,	0
221	Phase-Selective Synthesis of Ruthenium Phosphide in Hybrid Structure Enables Efficient Hybrid Water Electrolysis Under pH-Universal Conditions.. **2022**, e2200242	3
220	Synergic Reaction Kinetics over Adjacent Ruthenium Sites for Superb Hydrogen Generation in Alkaline Media.. **2022**, e2110604	4
219	Triggering electronic coupling between neighbouring hetero-diatomic metal sites promotes hydrogen evolution reaction kinetics. **2022**, 107296	3
218	Hybrid Ni 2 P / CoP Nanosheets as Efficient and Robust Electrocatalysts for Domestic Wastewater Splitting.	2
217	Aqueous ruthenium detection by microwave-assisted laser induced breakdown spectroscopy.	0
216	RuCo Alloy Nanoparticles Embedded into N-Doped Carbon for High Efficiency Hydrogen Evolution Electrocatalyst. **2022**, 15, 2908	0
215	Low-Pt Amount Supported Polypyrrole/MXene 1D/2D Electrocatalyst for Efficient Hydrogen Evolution Reaction.	2
214	Anion-Exchange Membrane Water Electrolyzers.. **2022**,	13
213	Advanced Ru/Ni/WC@NPC Multi-Interfacial Electrocatalyst for Efficient Sustainable Hydrogen and Chlor-Alkali Co-Production. 2200332	2
212	Atomically dispersed ruthenium in carbon aerogels as effective catalysts for pH-universal hydrogen evolution reaction. **2022**, 442, 136337	0
211	Highly dispersed ruthenium nanoparticles on nitrogen doped carbon toward efficient hydrogen evolution in both alkaline and acidic electrolytes.. **2022**, 12, 13932-13937	1
210	Band offset engineering at CN/MSe (M = Mo, W) interfaces.. **2022**, 12, 12068-12077	0
209	Connection of Ru nanoparticles with rich defects enables the enhanced electrochemical reduction of nitrogen.. **2022**,	1
208	Ruthenium Single Atoms Anchored on Commercial Carbon Cloth for Efficient Electrocatalytic Hydrogen Evolution Reaction.	

207	Boosting the performance gain of Ru/C for hydrogen evolution reaction via surface engineering.	0
206	RuCo Nanoparticles Embedded on Carbon Nanotubes through Spray Drying for Enhanced Hydrogen Evolution Electrocatalysis.	1
205	Ni-Mo Based Metal/Oxide Heterostructured Nanosheets with Largely Exposed Interfacial Atoms for Overall Water-splitting. **2022**, 153597	0
204	Modulating Pt-O-Pt atomic clusters with isolated cobalt atoms for enhanced hydrogen evolution catalysis.. **2022**, 13, 2430	7
203	ReviewRecent Advances in Development of Porous Carbon-Based Electrocatalysts for Water-Splitting Reaction.	
202	Ligand Charge DonationAcquisition Balance: A Unique Strategy to Boost Single Pt Atom Catalyst Mass Activity toward the Hydrogen Evolution Reaction. 5970-5978	1
201	A general synthetic strategy for N, P co-doped graphene supported metal-rich noble metal phosphides for hydrogen generation. **2022**,	
200	Scalable synthesis of hcp ruthenium-molybdenum nanoalloy as a robust bifunctional electrocatalyst for hydrogen evolution/oxidation. **2022**,	4
199	Effects of Ru Doping on the Structural Stability and Electrochemical Properties of Li2MoO3 Cathode Materials for Li-ion Batteries.	0
198	Environment-Benign General Synthesis of Inconsecutive Carbon Coated RuP2 Porous Microsheet as Efficient Bifunctional Electrocatalysts in Neutral Condition Enables Energy-Saving H2 Production under Hybrid Water Electrolysis.	1
197	Polydopamine Decorated Ru-Ni(OH)2 Nanosheets for Enhanced Performance of Hydrogen Evolution in Alkaline Media. 1	
196	Water electrolysis: from textbook knowledge to the latest scientific strategies and industrial developments.. **2022**,	21
195	Low-Temperature Water Electrolysis: Fundamentals, Progress, and New Strategies.	4
194	Hydrogen Evolution in Alkaline Medium on Intratube and Surface Decorated PtRu Catalyst. **2022**, 121541	0
193	Uniform cobalt nanoparticles embedded in nitrogen-doped graphene with abundant defects as high-performance bifunctional electrocatalyst in overall water splitting. **2022**,	0
192	Tuning strategies and structure effects of electrocatalysts for carbon dioxide reduction reaction. **2022**, 43, 1618-1633	
191	Surface facet dependence of Ru and Ru-based alloy oxidation resistance using ab initio thermodynamics calculation. **2022**, 122129	
190	Synergistically boosting the elementary reactions over multiheterogeneous ordered macroporous Mo 2 C/NC-Ru for highly efficient alkaline hydrogen evolution.	3

189	Metal-organic framework-derived Co nanoparticles and single atoms as efficient electrocatalyst for pH universal hydrogen evolution reaction.	1
188	Fe2+/Fe3+ Cycling for Coupling Self-powered Hydrogen Evolution and Preparations of Electrode Catalysts.	3
187	Confining Ultrafine Ru Clusters into TiO2 Lattice Frameworks to Yield Efficient and Ultrastable Electrocatalysts towards Practical Hydrogen Evolution. **2022**, 137248	1
186	Enhancing the Alkaline Hydrogen Evolution Reaction of Graphene Quantum Dots by Ethylenediamine Functionalization.	1
185	Single-Atom Catalysts for Hydrogen Generation: Rational Design, Recent Advances, and Perspectives. 2200875	5
184	Rationally Designed Ws2/C2n Layered Heterostructures for Enhanced Photocatalytic Hydrogen Evolution: Interface and Bandgap Engineering.	
183	Bifunctional atomically dispersed ruthenium electrocatalysts for efficient bipolar membrane water electrolysis.	0
182	Enhanced Hydrogen Evolution Via In Situ Generated 2D Black Phosphorous Nanocomposites at the Liquid/Liquid Interfaces.	0
181	Direct Growth of Carbon Nitride (C 3 N 3) Nanosheets on Copper Foam as an Efficient Catalytic Electrode for Electrochemical Hydrogen Evolution. **2022**, 9,	
180	Self-activatable carbon nanotube@ruthenium-catechol coordination complex for hydrogen evolution reaction.	
179	Fe 2+ /Fe 3+ Cycling for Coupling Self-Powered Hydrogen Evolution and Preparation of Electrode Catalysts.	
178	Efficient hydrogen evolution reaction at the phase transition boundary of polymorphic Mo1−xWxTe2. **2022**, 10, 061107	
177	Emerging Graphene Derivatives and Analogues for Efficient Energy Electrocatalysis. 2204755	1
176	Robust Ru-N metal-support interaction to promote self-powered H2 production assisted by hydrazine oxidation. **2022**, 100, 107467	2
175	Unveiling the nanoalloying modulation on hydrogen evolution activity of ruthenium-based electrocatalysts encapsulated by B/N co-doped graphitic nanotubes. **2022**, 316, 121626	0
174	Plasma-assisted highly dispersed Pt single atoms on Ru nanoclusters electrocatalyst for pH-universal hydrogen evolution. **2022**, 448, 137611	1
173	Sub-1 nm Pt nanoclusters on N and P co-doped carbon nanotubes for electrocatalytic hydrogen evolution reaction.	
172	Promoted photocarrier separation by dipole engineering in two-dimensional perovskite/C2N van der Waals heterostructures.	

171	Tuning the electronic communication of the Ru□O bond in ultrafine Ru nanoparticles to boost the alkaline electrocatalytic hydrogen production activity at large current density.	1
170	Emerging ruthenium single-atom catalysts for the electrocatalytic hydrogen evolution reaction.	1
169	An Ultrafast and Stable High-Entropy Metallic Glass Electrode for Alkaline Hydrogen Evolution Reaction. 1389-1396	2
168	Upgrading Organic Compounds through Electrooxidation Coupled with Hydrogen Evolution.	3
167	Upgrading Organic Compounds through Electrooxidation Coupled with Hydrogen Evolution.	
166	In-situ Surface Structural Reconstruction of NiMoO4 for Efficient Overall Water Splitting. **2022**, 154314	0
165	Molecular-level proton acceptor boosts oxygen evolution catalysis to enable efficient industrial-scale water splitting. **2022**,	0
164	Metal□rganic framework-derived Co@NMPC as efficient electrocatalyst for hydrogen evolution reaction: Revealing the synergic effect of pyridinic N□o. **2022**,	0
163	Bimetallic polyoxometalate derived Co/WN composite as electrocatalyst for high-efficiency hydrogen evolution. **2022**,	0
162	Simple synthesis of a CoO nanoparticle-decorated nitrogen-doped carbon catalyst from spent coffee grounds for alkaline hydrogen evolution.	0
161	Protrusion-Rich Cu@NiRu Core@shell Nanotubes for Efficient Alkaline Hydrogen Evolution Electrocatalysis. 2202496	1
160	Enhanced Photocatalytic Hydrogen Evolution from Water Splitting on Ta2O5/SrZrO3 Heterostructures Decorated with CuxO/RuO2 Cocatalysts.	2
159	Facile synthesis of the encapsulation of Co-based multimetallic alloys/oxide nanoparticles nirtogen-doped carbon nanotubes as electrocatalysts for the HER/OER. **2022**,	2
158	Comparative study on the distinct activity for NiFe-based phosphide and sulfide pre-electrocatalysts towards hydrogen evolution reaction. **2022**, 413, 425-433	1
157	Constructing double-shell structured N-C-in-Co/N-C electrocatalysts with nanorod- and rhombic dodecahedron-shaped hollow morphologies to boost electrocatalytic activity for hydrogen evolution and triiodide reduction reaction. **2022**, 449, 137854	2
156	Enhancing the electronic metal-support interaction of CoRu alloy and pyridinic N for electrocatalytic pH-universal hydrogen evolution reaction. **2022**, 450, 138026	1
155	Atomic equidistribution enhanced RuIr electrocatalysts for overall water splitting in the whole pH range. **2022**, 450, 137909	0
154	Competitive Adsorption: Reducing the Poisoning Effect of Adsorbed Hydroxyl on Ru Single-Atom Site with SnO2 for Efficient Hydrogen Evolution.	6

153	Ru Nanoparticles on Carbon Skeletons for an Efficient Hydrogen Evolution Reaction in Alkaline Electrolyte. **2022**, 7,	
152	In-plane strain engineering in ultrathin noble metal nanosheets boosts the intrinsic electrocatalytic hydrogen evolution activity. **2022**, 13,	6
151	Nanostructures and catalytic atoms engineering of tellurium-based materials and their roles in electrochemical energy conversion.	2
150	Synergistic Incorporating RuO 2 and NiFeOOH Layers onto Ni 3 S 2 Nanoflakes with Modulated Electron Structure for Efficient Water Splitting. 2200483	0
149	Amorphous/2H-MoS2 nanoflowers with P doping and S vacancies to achieve efficient pH-universal hydrogen evolution at high current density.	1
148	Recent Advances Regarding Precious Metal-Based Electrocatalysts for Acidic Water Splitting. **2022**, 12, 2618	0
147	Hollow-structured Amorphous Cu(OH)x Nanowires Doped with Ru for Wide pH Electrocatalytic Hydrogen Production. **2022**,	0
146	Crystalline Lattice-Confined Atomic Pt in Metal Carbides to Match Electronic Structures and Hydrogen Evolution Behaviors of Platinum. 2206368	4
145	Ethanol-Induced Hydrogen Insertion in Ultrafine IrPdH Boosts pH-Universal Hydrogen Evolution. 2204063	2
144	Hierarchically structured flower-like Ru nanoparticles-cucurbit[6]uril/multiwalled carbon nanotubes as efficient pH-universal hydrogen evolution electrocatalyst. **2022**,	
143	Coordination Engineering of Ultra-Uniform Ruthenium Nanoclusters as Efficient Multifunctional Catalysts for Zinc–Air Batteries. 2200035	2
142	Competitive Adsorption: Reducing the Poisoning Effect of Adsorbed Hydroxyl on Ru Single-Atom Site with SnO 2 for Efficient Hydrogen Evolution.	2
141	Ti3C2Tx MXene anchoring semi-metallic selenium atoms: Self-powered photoelectrochemical-type photodetector, hydrogen evolution, and gas-sensing applications.	2
140	Nitrogen Electroreduction on Borophene-Supported Atomic and Diatomic Transition Metals: Stability, Activity and Selectivity Improvements via Defect-Engineering.	
139	Ru anchored on Mo@MoO x nanowires as self-supported electrocatalysts for efficient hydrogen production in alkaline media.	
138	Recent Research Advances in Ruthenium-Based Electrocatalysts for Water Electrolysis Across the pH-Universal Conditions. 2200655	0
137	Identification of active sites and synergistic effect in multicomponent carbon-based Ru catalysts during electrocatalytic hydrogen evolution.	0
136	Ultrafine Ru nanoparticles derived from few-layered Ti3C2Tx MXene templated MOF for highly efficient alkaline hydrogen evolution. **2022**,	1

135	Theoretical study on the mechanism of CO2 adsorption and reduction by single-atom M (M = Cu, Co, Ni) doping C2N. **2022**, 804, 139902	1
134	Palladium-MXenes aerogel decorated by alkyne functionalized polyvinyl alcohol (PVA) as a highly efficient catalyst for electrocatalytic hydrogen evolution. **2022**, 805, 139942	
133	Enhanced hydrogen evolution via in situ generated 2D black phosphorous nanocomposites at the liquid/liquid interfaces. **2022**, 604, 154435	0
132	Synergistic effect of dual active sites over Ru/MoC for accelerating alkaline hydrogen evolution reaction. **2022**, 318, 121867	0
131	Convex Cube-Shaped Pt 34 Fe 5 Ni 20 Cu 31 Mo 9 Ru High Entropy Alloy Catalysts toward High-Performance Multifunctional Electrocatalysis. 2204255	0
130	Rationally designed WS2/C2N layered heterostructures for enhanced photocatalytic hydrogen evolution: Interface and bandgap engineering. **2022**, 605, 154720	0
129	Addressing the detrimental effect of CeO2 radical scavenger on the durability of polymer electrolyte membrane fuel cells. **2023**, 452, 139061	1
128	Toward the fast and durable alkaline hydrogen oxidation reaction on ruthenium.	4
127	Charge and Spin Communication between Dual Metal Single-Atom Sites on C2N Sheet: Regulating Electronic Spin Moments of Fe Atom for N2 Activation and Reduction.	0
126	Nitrogen-doped Ru film for energy-saving hydrogen production assisted with hydrazine oxidation. **2022**, 58, 10424-10427	1
125	Revealing and magnifying interfacial effects between ruthenium and carbon supports for efficient hydrogen evolution. **2022**, 10, 17730-17739	0
124	Ruthenium single-atom modulated Ti 3 C 2 T x MXene for efficient alkaline electrocatalytic hydrogen production.	1
123	Synergetic storage of ammonia over Al quantum dots embedded graphene sheets: A first principles perspective. **2022**,	0
122	Inner Co Synergizing Outer Ru Supported on Carbon Nanotubes for Efficient pH-Universal Hydrogen Evolution Catalysis. **2022**, 14,	0
121	Reversible hydrogen spillover in Ru-WO3-x enhances hydrogen evolution activity in neutral pH water splitting. **2022**, 13,	10
120	Self-templating synthesis and structural regulation of nanoporous rhodium-nickel alloy nanowires efficiently catalyzing hydrogen evolution reaction in both acidic and alkaline electrolytes.	0
119	Interfacial Nanobubbles Growth at the Initial Stage of Electrocatalytic Hydrogen Evolution.	0
118	Hydrogen evolution reaction activity obtained using platinum single atoms on TiO2 nanosheets modified with graphene. **2022**, 57, 16448-16459	0

117	Atomically dispersed chromium coordinated with hydroxyl clusters enabling efficient hydrogen oxidation on ruthenium. **2022**, 13,	3
116	Interface engineering of snow-like Ru/RuO2 nanosheets for boosting hydrogen electrocatalysis. **2022**,	1
115	Coupling of nanocrystal hexagonal array and two-dimensional metastable substrate boosts H2-production. **2022**, 13,	1
114	Nanoscale hetero-interfaces for electrocatalytic and photocatalytic water splitting. **2022**, 23, 587-616	0
113	Transition metal single atom embedded GaN monolayer surface for efficient and selective CO2 electroreduction.	0
112	Electron Accumulation Effect over Osmium/Erlichmanite Heterointerfaces for Intensified pH-Universal Hydrogen Evolution. 13312-13320	2
111	Phosphorus-Rich Ruthenium Phosphide Embedded on a 3D Porous Dual-Doped Graphitic Carbon for Hydrogen Evolution Reaction. **2022**, 12, 3597	0
110	Engineering single atomic ruthenium on defective nickel vanadium layered double hydroxide for highly efficient hydrogen evolution.	0
109	Tuning Structure and Properties of Pt Catalysts Confined in Single-Walled Carbon Nanotubes (SWNTs) for Electrocatalysis.	0
108	A short review on generation of green fuel hydrogen through water splitting. **2022**,	2
107	Lattice Strain and Schottky Junction Dual Regulation Boosts Ultrafine Ruthenium Nanoparticles Anchored on a N-Modified Carbon Catalyst for H2 Production. **2022**, 144, 19619-19626	3
106	Interfacial water engineering boosts neutral water reduction. **2022**, 13,	4
105	Enhancing Resistance to Chloride Corrosion by Controlling the Morphologies of PtNi Electrocatalysts for Alkaline Seawater Hydrogen Evolution.	0
104	Electrospun nano-Ru doped carbon nanofibers for efficient alkaline hydrogen evolution reaction. **2022**, 809, 140147	0
103	Development of self-supporting catalyst based on bionic honeycomb communication channel from biomass cork waste for hydrogen evolution. **2022**, 551, 232219	0
102	Ru monolayer island doped MoS2 catalysts for efficient hydrogen evolution reaction. **2023**, 453, 139803	2
101	Identifying the roles of Ru single atoms and nanoclusters for energy-efficient hydrogen production assisted by electrocatalytic hydrazine oxidation. **2023**, 323, 122145	0
100	A crystal glass□nanostructured Al-based electrocatalyst for hydrogen evolution reaction. **2022**, 8,	2

99	Tuning Mass Transport in Electrocatalysis Down to Sub-5nm Through Nanoscale Grade Separation.	4
98	Tuning Mass Transport in Electrocatalysis Down to Sub-5nm Through Nanoscale Grade Separation.	0
97	Modulating Electronic Environment of Ru Nanoclusters via Local Charge Transfer for Accelerating Alkaline Water Electrolysis. 2204738	0
96	Controllable synthesis of efficient and robust carbon-incorporated ruthenium–cobalt mixed metal phosphide-based bifunctional electrocatalyst for the water and urea oxidation. **2023**, 27, 101290	0
95	High-performing catalysts for energy-efficient commercial alkaline water electrolysis. **2022**, 7, 31-60	2
94	Theoretical insight into the relevance between the oxidation states of CeO2 supported Pt4+/2+/1+/0/2δ and their HER performance. **2022**, 25, 40-47	0
93	Laser induced trace doping of Pd on Ru nanoparticles for an efficient hydrogen evolution electrocatalyst.	0
92	Engineering a local potassium cation concentrated microenvironment toward the ampere-level current density hydrogen evolution reaction.	0
91	Rhenium anchored Ti3C2Tx (MXene) nanosheets for electrocatalytic hydrogen production.	0
90	TiC-Supported ruthenium nanoparticles as an efficient electrocatalyst for the hydrogen evolution reaction. **2023**, 147, 110267	0
89	Palladium nanoparticles supported on LDH: A highly efficient and recyclable heterogeneous catalyst for the Heck reaction. **2023**, 232, 106765	0
88	A critical review on transition metal phosphide based catalyst for electrochemical hydrogen evolution reaction: Gibbs free energy, composition, stability, and true identity of active site. **2023**, 478, 214956	0
87	Tailored nitrogen-defect induced by diels-alder reaction for enhanced electrochemical hydrogen evolution reaction. **2023**, 633, 754-763	0
86	Interfacial Electronic Engineering of NiSe2 Anchored NiNC Composite Electrocatalyst for Efficient Hydrogen Evolution. **2022**, 12, 1525	0
85	Coordinatively unsaturated single Co atoms immobilized on C2N for efficient oxygen reduction reaction.	1
84	Inner-pore reduction nucleation of palladium nanoparticles in highly conductive wurster-type covalent organic frameworks for efficient oxygen reduction electrocatalysis. **2022**,	1
83	Optimizing the electronic structure of Fe-doped Co3O4 supported Ru catalyst via metal-support interaction boosting oxygen evolution reaction and hydrogen evolution reaction. **2022**, 108085	1
82	Metastable Metal–Alloy Interface in RuNi Nanoplates Boosts Highly Efficient Hydrogen Electrocatalysis. **2022**, 5, 17496-17502	0

81	Regulating the metal-support interactions by tuning the ratios between N and B based on the C2N motif to develop efficient Pd-based catalysts for CO oxidative coupling to DMO: A DFT study. **2022**, 156205	0
80	Facile synthesis of Ru nanoclusters embedded in carbonaceous shells for hydrogen evolution reaction in alkaline and acidic media. **2022**, 117116	0
79	Ruthenium nanoparticles loaded on N/P co-doped carbon sphere derived from sphere cross-linked hydrogel for highly improved hydrogen evolution reaction. **2022**, 126996	0
78	Understanding the Atomic and Defective Interface Effect on Ruthenium Clusters for the Hydrogen Evolution Reaction. 49-59	2
77	Phase Transformation from Amorphous RuSx to Ru-RuS2 Hybrid Nanostructure for Efficient Water Splitting in Alkaline Media.	0
76	Research Progress of Metal Oxide as Cathode Materials for Hydrogen Evolution. ArticleID:221249	0
75	ZIF 67 derived hybrid CuCo2S4@MoS2 catalyst for efficient electrocatalytic hydrogen evolution reaction. **2022**, 123809	0
74	Ti3C2Tx nanosheets with uniformly anchored Ru nanoparticles for efficient acidic and basic hydrogen evolution reaction. **2022**,	0
73	Observation of a robust and active catalyst for hydrogen evolution under high current densities. **2022**, 13,	1
72	Screening Nickel-Doped Mo2C Nanorod Arrays for Ultrastable and Efficient Hydrogen Evolution over a Wide pH Range.	0
71	Electronic Structure-Dependent Water-Dissociation Pathways of Ruthenium-Based Catalysts in Alkaline H 2 -Evolution. 2206949	1
70	Investigation the sensing behavior of pristine and Ti-doped C2N monolayer toward H2S gas. **2023**, 110385	0
69	Arming Ru with Oxygen Vacancy Enriched RuO 2 Sub-nanometer Skin Activates Superior Bifunctionality for pH-Universal Overall Water Splitting. 2206351	3
68	Activating Ru?O?Co Interaction on the a -Co(OH) 2 @Ru Interface for Accelerating the Volmer Step of Alkaline Hydrogen Evolution. 2201362	0
67	Functional Surfactant-Induced Long-Range Compressive Strain in Curved Ultrathin Nanodendrites Boosts Electrocatalysis.	0
66	Epitaxial interface stabilizing iridium dioxide toward the oxygen evolution reaction under high working potentials.	0
65	Fullerene Lattice-Confined Ru Nanoparticles and Single Atoms Synergistically Boost Electrocatalytic Hydrogen Evolution Reaction. 2213058	1
64	WITHDRAWN: Synthesis of rGO supported Ru-doped CoTe nanowires for induced HER selectivity in overall water splitting. **2023**, 296, 127356	0

63	Nickel metaphosphate supported ruthenium for all pH hydrogen evolution: From single atom, cluster to nanoparticle. **2023**, 325, 122331	0
62	N-Doped Carbon Shells Encapsulated Ru-Ni Nanoalloys for Efficient Hydrogen Evolution Reaction.	0
61	Potential of Single Transition Metal Atom Embedded C 2 N as Efficient Catalysts for N 2 O Reduction: Theoretical Investigation. 2200680	0
60	Kinetically Accelerating Elementary Steps via Bridged Ru-H State for the Hydrogen-Evolution in Anion-Exchange Membrane Electrolyzer. 2212321	1
59	Engineering Pt Coordination Environment with Atomically Dispersed Transition Metal Sites Toward Superior Hydrogen Evolution. 2204213	0
58	Emerging Trends of Carbon-Based Quantum Dots: Nanoarchitectonics and Applications. 2207181	0
57	Stabilization of unprecedented crystal phases of metal nanomaterials. **2023**,	0
56	Ta3N5 Nanobelt-Loaded Ru Nanoparticle Hybrids□Electrocatalysis for Hydrogen Evolution in Alkaline Media. **2023**, 28, 1100	0
55	Theoretical study the electrocatalytic performance and mechanism of novel designed electrocatalyst Ru@2DMs for CO2RR. **2023**, 340, 127541	0
54	High-entropy alloys in water electrolysis: Recent advances, fundamentals, and challenges.	0
53	Effect of Ascorbic Acid Concentration on Cu2O Production for Photoelectrochemical Water Splitting on Photocathode Thin Films. **2022**, 25, 442-449	0
52	Progress in electrocatalytic hydrogen evolution of transition metal alloys: synthesis, structure, and mechanism analysis.	0
51	Lattice Distorted Rhodium Nanocrystals in Porous Nanofiber toward Aqueous Zinc-CO2 System. **2023**, 5, 1271-1280	0
50	Size□elected Cu4 cluster anchored on C2N monolayer for efficient nitrite electroreduction to ammonia: a computational study. **2023**, 620, 156825	0
49	Sintering-free catalytic ammonia cracking by vertically standing 2D porous framework supported Ru nanocatalysts. **2023**, 463, 142474	0
48	Inducing electronic asymmetricity on Ru clusters to boost key reaction steps in basic hydrogen evolution. **2023**, 327, 122466	0
47	Rational design of 2D heterostructured photo- & electro-catalysts for hydrogen evolution reaction: A review. **2023**, 15, 100402	0
46	Heterostructured CNT-RuSx nanomaterials for efficient electrochemical hydrogen evolution reaction. **2023**, 331, 122681	0

45	Atomic ruthenium modification of nickel-cobalt alloy for enhanced alkaline hydrogen evolution. **2023**, 331, 122710	0
44	Breaking Volmer step limitation on NiO/PtNi heterojunctions via ATO-induced charge injection and interfacial modulation. **2023**, 331, 122684	0
43	Merging Platinum Single Atoms to Achieve Ultrahigh Mass Activity and Low Hydrogen Production Cost. **2023**, 17, 2923-2931	0
42	MOF-derived ultrasmall Ru@RuO2 heterostructures as bifunctional and pH-universal electrocatalysts for 0.79 V asymmetric amphoteric overall water splitting. **2023**, 460, 141672	1
41	Ion exchange synthesis of Fe-doped clustered CoP nanowires as superior electrocatalyst for hydrogen evolution reaction. **2023**,	0
40	Interface-Enhanced SiOx/Ru Heterocatalysts for Efficient Electrochemical Water Splitting. **2023**, 15, 8200-8207	0
39	Recent advances of ruthenium-based electrocatalysts for hydrogen energy. **2023**, 5, 225-239	0
38	Plasma-synthesized platinum single atom and nanoparticle catalysts for high-current density hydrogen evolution. **2023**, 460, 141676	0
37	Recent Progress on Metal Catalysts for Electrochemical Hydrogen Evolution. **2023**, 147-180	0
36	Electrocatalysts for Hydrogen Evolution Reaction. **2023**, 115-146	0
35	A combined experimental and theoretical study of RuO2/TiO2 heterostructures as a photoelectrocatalyst for hydrogen evolution. **2023**, 52, 3472-3481	0
34	Noble Metal-Based Heterogeneous Catalysts for Electrochemical Hydrogen Evolution Reaction. **2023**, 13, 2177	0
33	First-principles study of the effect of the local coordination environment on the electrochemical activity of Pd1-CxNy single atom catalysts. **2023**, 270, 118551	0
32	Mo doped Ru-based cluster to promote alkaline hydrogen evolution with ultra-low Ru loading. **2023**, 100031	1
31	Homogeneous Metastable Hexagonal Phase Iridium Enhances Hydrogen Evolution Catalysis. **2023**, 10,	0
30	Hydrogen Production from Water Electrolysis: The Role of OER and HER Electrocatalysts. 73-119	0
29	Surface distortion of FeRu nanoparticles improves the hydrogen evolution reaction performance in alkaline media. **2023**, 15, 5816-5824	0
28	Multicomponent Intermetallic Nanoparticles on Hierarchical Metal Network as Versatile Electrocatalysts for Highly Efficient Water Splitting. 2214412	0

27	Regulating Hollow Carbon Cage Supported NiCo Alloy Nanoparticles for Efficient Electrocatalytic Hydrogen Evolution Reaction. **2023**, 15, 12078-12087	0
26	Self-Accommodation Induced Electronic Metal□Support Interaction on Ruthenium Site for Alkaline Hydrogen Evolution Reaction.	0
25	Self-Supported Ru-Incorporated NiSe 2 for Ampere-Level Current Density Hydrogen Evolution.	0
24	Hexagonal Co 9 S 8 : Experimental and Mechanistic Study of Enhanced Electrocatalytic Hydrogen Evolution of a New Crystallographic Phase. 2210298	0
23	Interfacial nanobubbles□growth at the initial stage of electrocatalytic hydrogen evolution.	0
22	In Situ Generation of Pt 2 Co 3 Nano-Alloys in Porous N-Doped Carbon for Highly Efficient Electrocatalytic Hydrogen Evolution.	0
21	Recent advances and future prospects on Ni3S2-Based electrocatalysts for efficient alkaline water electrolysis. **2023**,	0
20	Ruthenium doping in the MoS2/AB heterostructure for the hydrogen evolution reaction in acidic media. **2023**, 52, 4891-4899	0
19	Ensemble Effect of Ruthenium Single-Atom and Nanoparticle Catalysts for Efficient Hydrogen Evolution in Neutral Media.	0
18	Light-Induced Bipolar Photoresponse with Amplified Photocurrents in an Electrolyte-Assisted Bipolar p□ Junction.	0
17	Ruthenium/TiO 2 -Catalyzed Hydrogenolysis of Polyethylene Terephthalate: Reaction Pathways Dominated by Coordination Environment.	0
16	Ruthenium/TiO 2 -Catalyzed Hydrogenolysis of Polyethylene Terephthalate: Reaction Pathways Dominated by Coordination Environment.	0
15	Impact of impurities on water electrolysis: a review. **2023**, 7, 1565-1603	0
14	Boosting alkaline hydrogen evolution performance by constructing ultrasmall Ru clusters/Na+, K+-decorated porous carbon composites.	0
13	Catalytic Reduction of N2O by CO on Single-Atom Catalysts Au/C2N and Cu/C2N: A First-Principles Study. **2023**, 13, 578	0
12	Recent Development of Self-Supported Alkaline Hydrogen Evolution Reaction Electrocatalysts for Industrial Electrolyzer. 2200178	0
11	Ultra-fine Ru nanoparticles decorated V2O3 as a pH-universal electrocatalyst for efficient hydrogen evolution reaction. **2023**,	0
10	Quantum Chemical Study the Removal of Acetone by Using the Pristine and Si-doped C2N Monolayer.	0

9	Doping of Cr to Regulate the Valence State of Cu and Co Contributes to Efficient Water Splitting. **2023**, 15, 16552-16561	0
8	Synergistic effect between Ru cluster and Co3O4 nanowires assisted by B-O bonding for hydrogen evolution. **2023**, 953, 169826	0
7	Spontaneous hydrogen production using gadolinium telluride. **2023**, 26, 106510	0
6	Lamella-heterostructured nanoporous bimetallic iron-cobalt alloy/oxyhydroxide and cerium oxynitride electrodes as stable catalysts for oxygen evolution. **2023**, 14,	0
5	?????????????????????? ??????????.	0
4	FeC6N monolayer with ideal properties for water splitting. **2023**, 626, 157203	0
3	Recent Advances, Properties, Fabrication and Opportunities in Two-Dimensional Materials for their Potential Sustainable Applications. **2023**, 102780	0
2	Electronic Structure Engineering of Pt Species over Pt/WO 3 toward Highly Efficient Electrocatalytic Hydrogen Evolution.	0
1	Electrocatalytic performance of hetrostructured MoS2/Ag2S/Ag nanocomposites for hydrogen evolution reaction. **2023**, 162, 107519	0