Scientometric analysis of research trends on solid oxide electrolysis cells for green hydrogen and syngas production

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Table S1 Top-cited articles in different areas

Research Area	Article	Authors
Energy Fuels	Eliminating degradation in solid oxide electrochemical cells by reversible operation	Graves et al. [1]
	Electrolysis of carbon dioxide in Solid Oxide Electrolysis Cells	Ebbesen et al. [2]
Engineering	Electrolysis of carbon dioxide in Solid Oxide Electrolysis Cells	Ebbesen et al. [2]
	Co-electrolysis of CO_2 and H_2O in solid oxide cells: Performance and durability	Graves et al. [3]
Chemistry	Eliminating degradation in solid oxide electrochemical cells by reversible operation	Graves et al. [1]
	Investigation of the Support Effect in Atomically Dispersed Pt on WO_{3-x} for Utilization of Pt in the Hydrogen Evolution Reaction	Park et al. [4]
Electrochemistry	Eliminating degradation in solid oxide electrochemical cells by reversible operation	Graves et al. [1]
	Electrolysis of carbon dioxide in Solid Oxide Electrolysis Cells	Ebbesen et al. [2]
Materials Science	Eliminating degradation in solid oxide electrochemical cells by reversible operation	Graves et al. [1]
	Hybrid-solid oxide electrolysis cell: A new strategy for efficient hydrogen production	Kim et al. [5]
Physics	Eliminating degradation in solid oxide electrochemical cells by reversible operation	Graves et al. [1]
	Hybrid-solid oxide electrolysis cell: A new strategy for efficient hydrogen production	Kim et al. [5]
Science Technology Other Topics	Hybrid-solid oxide electrolysis cell: A new strategy for efficient hydrogen production	Kim et al. [5]
	Promoting exsolution of RuFe alloy nanoparticles on $Sr_2Fe_{1.4}Ru_{0.1}Mo_{0.5}O_{6-\delta}$ via repeated redox manipulations for CO_2 electrolysis	Lv et al. [6]
Crystallography	Solid oxide electrolysis cells: Degradation at high current Ddensities	Knibbe et al. [7]
	Reducing d-p band coupling to enhance CO_2 electrocatalytic activity by Mg-doping in $Sr_2FeMoO_{6-\delta}$ double perovskite for high performance solid oxide electrolysis cells	Xi et al. [8]
Thermodynamics	Techno-economic analysis and Monte Carlo simulation of green hydrogen production technology through various water electrolysis technologies	Jang et al. [9]
	Thermodynamic assessment of a novel multi-generation solid oxide fuel cell-based system for production of	Haghghi et al. [10]

	electrical power, cooling, fresh water, and hydrogen	
Business Economics	Techno-economic analysis and Monte Carlo simulation of green hydrogen production technology through various water electrolysis technologies	Jang et al. [9]
	Multi-objective optimization and comparative performance analysis of hybrid biomass-based solid oxide fuel cell/solid oxide electrolyzer cell/gas turbine using different gasification agents	Habibollahzade et al. [11]
Environmental science Ecology	Techno-economic analysis and Monte Carlo simulation of green hydrogen production technology through various water electrolysis technologies	Jang et al. [9]
	Large-scale electricity storage utilizing reversible solid oxide cells combined with underground storage of CO_2 and CH_4	Jensen et al. [12]
Mathematics	Techno-economic analysis and Monte Carlo simulation of green hydrogen production technology through various water electrolysis technologies	Jang et al. [9]
	Multi-objective optimization and comparative performance analysis of hybrid biomass-based solid oxide fuel cell/solid oxide electrolyzer cell/gas turbine using different gasification agents	Habibollahzade et al. [11]
Mechanics	Techno-economic analysis and Monte Carlo simulation of green hydrogen production technology through various water electrolysis technologies	Jang et al. [9]
	Thermodynamic assessment of a novel multi-generation solid oxide fuel cell-based system for production of electrical power, cooling, fresh water, and hydrogen	Haghghi et al. [10]
Metallurgy Metallurgical Engineering	Incubation time for flash sintering as caused by internal reactions, exemplified for yttria stabilized zirconia	Kirchheim et al. [13]
	An integrative process of blast furnace and SOEC for hydrogen utilization: Techno-economic and environmental impact assessment	Kim et al. [14]

Table S2 Most cited articles about the fuel electrode of SOECs average year excluding reviews

Title	Authors	Year	Total Citations	Average Citations per year
Enhancing CO_2 electrolysis performance with vanadium-doped perovskite cathode in solid oxide electrolysis cell	Zhou et al. [15]	2018	128	21.33
Step-change in high temperature steam electrolysis performance of perovskite	Tsekouras et al. [16]	2013	228	20.73

oxide cathodes with exsolution of B-site dopants				
Comparison of microstructural evolution of fuel electrodes in solid oxide fuel cells and electrolysis cells	Trini et al. [17]	2020	71	17.75
A novel fuel electrode enabling direct CO_2 electrolysis with excellent and stable cell performance	Li et al. [18]	2017	108	15.43
Mixed-Conductor $Sr_2Fe_{1.5}Mo_{0.5}O_{6-\delta}$ as Robust Fuel Electrode for Pure CO_2 Reduction in Solid Oxide Electrolysis Cell	Li et al. [19]	2017	96	13.71
Infiltration of $Ce_{0.8}Gd_{0.2}O_{1.9}$ nanoparticles on $Sr_2Fe_{1.5}Mo_{0.5}O_{6-\delta}$ cathode for CO_2 electroreduction in solid oxide electrolysis cell	Lv et al. [20]	2019	61	12.20
Efficient water splitting through solid oxide electrolysis cells with a new hydrogen electrode derived from A-site cation-deficient $La_{0.4}Sr_{0.55}Co_{0.2}Fe_{0.6}Nb_{0.2}O_{3-\delta}$ perovskite	Teng et al. [21]	2020	48	12.00
Highly active and redox-stable Ce-doped LaSrCrFeO-based cathode catalyst for CO_2 SOECs	Zhang et al. [22]	2016	95	11.88
CO_2-to-CO conversion on layered perovskite with in situ exsolved Co-Fe alloy nanoparticles: an active and stable cathode for solid oxide electrolysis cells	Liu et al. [23]	2016	94	11.75
Hydrogen production through steam electrolysis: Model-based steady state performance of a cathode-supported intermediate temperature solid oxide electrolysis cell	Udagawa et al. [24]	2007	196	11.53
Production of syngas with controllable H_2/CO ratio by high temperature co-electrolysis of CO_2 and H_2O over Ni and Co-doped lanthanum strontium ferrite perovskite cathodes	Deka et al. [25]	2019	55	11.00
Enhancing electrochemical CO_2 reduction using Ce(Mn,Fe)O_2 with La(Sr)Cr(Mn)O_3 cathode for high-temperature solid oxide electrolysis	Lee et al. [26]	2021	33	11.00

cells				
High-performing proton-conducting solid oxide fuel cells with triple-conducting cathode of $Pr_{0.5}Ba_{0.5}(Co_{0.7}Fe_{0.3})O_{3-\delta}$ tailored with W	Tao et al. [27]	2022	32	10.67
Mutual conversion of CO-CO_2 on a perovskite fuel electrode with endogenous alloy nanoparticles for reversible solid oxide cells	Li et al. [28]	2022	21	10.50
Alternative cathode material for CO_2 reduction by high temperature solid oxide electrolysis cells	Yue et al. [29]	2012	124	10.33
Investigation of hetero-phases grown via *in-situ* exsolution on a Ni-doped (La,Sr)FeO_3 cathode and the resultant activity enhancement in CO_2 reduction	Deka et al. [30]	2021	31	10.33
Enhancing CO_2 catalytic activation and direct electroreduction on in-situ exsolved Fe/MnO_x nanoparticles from $(Pr,Ba)_{(2)}Mn_{2-y}Fe_yO_{5+\delta}$ layered perovskites for SOEC cathodes	Zhu et al. [31]	2020	41	10.25
$(La_{0.75}Sr_{0.25})_{(0.95)}Mn_{0.5}Cr_{0.5}O_3$ as the cathode of solid oxide electrolysis cells for high temperature hydrogen production from steam	Yang et al. [32]	2008	161	10.06
Enhancing electrocatalytic CO_2 reduction in solid oxide electrolysis cell with $Ce_{0.9}Mn_{0.1}O_{2-\delta}$ nanoparticles-modified LSCM-GDC cathode	Zhang et al. [33]	2018	60	10.00
Alkaline-earth elements (Ca, Sr and Ba) doped $LaFeO_{3-\delta}$ cathodes for CO_2 electroreduction	Hu et al. [34]	2019	50	10.00
Average		2017.25	86.65	16.62

Table S3 Most cited articles about the air electrode of SOECs on average per year excluding reviews

Title	Authors	Year	Total Citations	Average Citations per year
High performing triple-conductive $Pr_2NiO_{4+\delta}$ anode for proton-conducting steam solid oxide electrolysis cell	Li et al. [35]	2018	77	12.83
Failure mechanism of $(La,Sr)MnO_3$ oxygen electrodes of solid oxide electrolysis cells	Chen et al. [36]	2011	154	11.85
Electrochemical performance and stability of cobalt-free $Ln_{(12)}Sr_{(0.8)}NiO_{(4)}$ (Ln=La and Pr) air electrodes for proton-conducting reversible solid oxide cells	Yang et al. [37]	2018	71	11.83
LSM-YSZ interactions and anode delamination in solid oxide electrolysis cells	Keane et al. [38]	2012	124	10.33
Influence of the oxygen electrode and inter-diffusion barrier on the degradation of solid oxide electrolysis cells	Hjalmarsson et al. [39]	2013	109	9.91
Intermediate-temperature solid oxide electrolysis cells with thin proton-conducting electrolyte and a robust air electrode	Lei et al. [40]	2017	68	9.71
Conditions for stable operation of solid oxide electrolysis cells: oxygen electrode effects	Park et al. [41]	2019	48	9.60
Electrolyte degradation in anode supported microtubular yttria stabilized zirconia-based solid oxide steam electrolysis cells at high voltages of operation	Laguna-Bercero et al. [42]	2011	116	8.92
Improved stability of reversible solid oxide cells with a nickelate-based oxygen electrode	Laguna-Bercero et al. [43]	2016	71	8.88
Suppressed Sr segregation and performance of directly assembled $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ oxygen electrode on Y_2O_3-ZrO_2 electrolyte of solid oxide electrolysis cells	Ai et al. [44]	2018	52	8.67
Degradation mechanism of electrolyte and air electrode in solid oxide	Kim et al. [45]	2013	92	8.36

electrolysis cells operating at high polarization				
Electrochemical performance and stability of lanthanum strontium cobalt ferrite oxygen electrode with gadolinia doped ceria barrier layer for reversible solid oxide fuel cell	Fan et al. [37]	2014	76	7.60
Highly active and stable $Er_{0.4}Bi_{1.6}O_3$ decorated $La_{0.76}Sr_{0.19}MnO_{3+\delta}$ nanostructured oxygen electrodes for reversible solid oxide cells	Ai et al. [46]	2017	51	7.29
High temperature solid oxide electrolysis cell employing porous structured $(La_{0.75}Sr_{0.25})_{(0.95)}MnO_3$ with enhanced oxygen electrode performance	Yang et al. [47]	2010	100	7.14
A new anode material for solid oxide electrolyser: The neodymium nickelate $Nd_2NiO_{4+\delta}$	Chauveau et al. [48]	2010	99	7.07
Electrochemical stability of $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$-infiltrated YSZ oxygen electrode for reversible solid oxide fuel cells	Fan et al. [49]	2014	68	6.80
Performance enhancement of solution impregnated nanostructured $La_{0.8}Sr_{0.2}Co_{0.8}Ni_{0.2}O_{3-\delta}$ oxygen electrode for intermediate temperature solid oxide electrolysis cells	Tan et al. [50]	2016	54	6.75
Performance of $La_{0.1}Sr_{0.9}Co_{0.8}Fe_{0.2}O_{3-\delta}$ and $La_{0.1}Sr_{0.9}Co_{0.8}Fe_{0.2}O_{3-\delta}$-$Ce_{0.9}Gd_{0.1}O_2$ oxygen electrodes with $Ce_{0.9}Gd_{0.1}O_2$ barrier layer in reversible solid oxide fuel cells	Choi et al. [51]	2013	74	6.73
Degradation mechanism in $La_{0.8}Sr_{0.2}CoO_3$ as contact layer on the solid oxide electrolysis cell anode	Sharma et al. [52]	2010	91	6.50
Reversible operation of microtubular solid oxide cells using $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$-$Ce_{0.9}Gd_{0.1}O_{2-\delta}$ oxygen electrodes	Lopez-Robledo et al. [53]	2018	39	6.50
Average		2014.4	81.7	8.66

Table S4 Most cited articles about the electrolyte of SOECs on average per year excluding reviews

Title	Authors	Year	Total Citations	Average Citations per year
23,000 h steam electrolysis with an electrolyte supported solid oxide cell	Schefold et al. [54]	2017	75	10.71
A new Dy-doped $BaCeO_3$-$BaZrO_3$ proton-conducting material as a promising electrolyte for reversible solid oxide fuel cells	Lyagaeva et al. [55]	2016	80	10.00
Y-doped $BaZrO_3$ as a chemically stable electrolyte for proton-conducting solid oxide electrolysis cells (SOECs)	Bi et al. [56]	2015	89	9.89
Intermediate-temperature solid oxide electrolysis cells with thin proton-conducting electrolyte and a robust air electrode	Lei et al. [40]	2017	68	9.71
Electrolyte degradation in anode supported microtubular yttria stabilized zirconia-based solid oxide steam electrolysis cells at high voltages of operation	Laguna-Bercero et al. [42]	2011	116	8.92
Electrode performance and analysis of reversible solid oxide fuel cells with proton conducting electrolyte of $BaCe_{0.5}Zr_{0.3}Y_{0.2}O_{3-\delta}$	He et al. [57]	2010	122	8.71
Suppressed Sr segregation and performance of directly assembled $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ oxygen electrode on Y_2O_3-ZrO_2 electrolyte of solid oxide electrolysis cells	Ai et al. [44]	2018	52	8.67
Degradation mechanism of electrolyte and air electrode in solid oxide electrolysis cells operating at high polarization	Kim et al. [45]	2013	92	8.36
High-performing electrolyte-supported symmetrical solid oxide electrolysis cells operating under steam electrolysis and co-electrolysis modes	Bernadet et al. [58]	2020	33	8.25
Ni-Fe-La(Sr)Fe(Mn)O_3 as a new active cermet cathode for intermediate-temperature CO_2 electrolysis using a $LaGaO_3$-based electrolyte	Wang et al. [59]	2015	70	7.78

Synergistic coupling of proton conductors $BaZr_{0.1}Ce_{0.7}Y_{0.1}Yb_{0.1}O_{3-\delta}$ and $La_2Ce_2O_7$ to create chemical stable, interface active electrolyte for steam electrolysis cells	Li et al. [60]	2019	38	7.60
Tri-doped $BaCeO_3$-$BaZrO_3$ as a chemically stable electrolyte with high proton-conductivity for intermediate temperature solid oxide electrolysis cells (SOECs)	Rajendran et al. [61]	2020	28	7.00
Potential jumps at transport bottlenecks cause instability of nominally ionic solid electrolytes in electrochemical cells	Dong et al. [62]	2020	27	6.75
Intermediate temperature solid oxide electrolysis cell using $LaGaO_3$ based perovskite electrolyte	Ishihara et al. [63]	2010	90	6.43
Solid oxide cells with zirconia/ceria Bi-Layer electrolytes fabricated by reduced temperature firing	Gao et al. [64]	2015	56	6.22
Low-temperature co-sintering for fabrication of zirconia/ceria bi-layer electrolyte via tape casting using a Fe_2O_3 sintering aid	Mehranjani et al. [65]	2017	41	5.86
$La_{0.8}Sr_{0.2}FeO_{3-\delta}$ as fuel electrode for solid oxide reversible cells using $LaGaO_3$-based oxide electrolyte	Hosoi et al. [66]	2016	43	5.38
Development of oxygen electrodes for reversible solid oxide fuel cells with scandia stabilized zirconia electrolytes	Laguna-Bercero et al. [67]	2011	72	5.54
Various synthesis methods of aliovalent-doped ceria and their electrical properties for intermediate temperature solid oxide electrolytes	Kim et al. [68]	2013	60	5.45
Power generation and steam electrolysis characteristics of an electrochemical cell with a zirconia- or ceria-based electrolyte	Eguchi et al. [69]	1996	152	5.43
Average		2014.45	70.30	7.65

Table S5 Most cited articles about co-electrolysis in SOECs on average per year excluding reviews

Title	Authors	Year	Total Citations	Average Citations per year

Co-electrolysis of CO_2 and H_2O in solid oxide cells: Performance and durability	Graves et al. [3]	2011	325	25.00
In-situ growth of nanoparticles-decorated double perovskite electrode materials for symmetrical solid oxide cells	Niu et al. [70]	2020	57	14.25
Production of Fischer-Tropsch liquid fuels from high temperature solid oxide co-electrolysis units	Becker et al. [71]	2012	165	13.75
Synthetic natural gas via integrated high-temperature electrolysis and methanation: Part I-Energy performance	Giglio et al. [72]	2015	113	12.56
Direct synthesis of methane from CO_2-H_2O co-electrolysis in tubular solid oxide electrolysis cells	Chen et al. [73]	2014	125	12.5
2D thermal modeling of a solid oxide electrolyzer cell (SOEC) for syngas production by H_2O/CO_2 co-electrolysis	Ni [74]	2012	139	11.58
High-yield electrochemical upgrading of CO_2 into CH_4 using large-area protonic ceramic electrolysis cells	Pan et al. [75]	2022	23	11.5
An electrochemical model for syngas production by co-electrolysis of H_2O and CO_2	Ni [76]	2012	132	11.00
Production of syngas with controllable H_2/CO ratio by high temperature co-electrolysis of CO_2 and H_2O over Ni and Co- doped lanthanum strontium ferrite perovskite cathodes	Deka et al. [25]	2019	55	11.00
Modeling a novel combined solid oxide electrolysis cell (SOEC)—Biomass gasification renewable methanol production system	Ali et al. [77]	2020	44	11.00
Durable SOC stacks for production of hydrogen and synthesis gas by high temperature electrolysis	Ebbesen et al. [78]	2011	142	10.92
23,000 h steam electrolysis with an electrolyte supported solid oxide cell	Schefold et al. [54]	2017	75	10.71
Thermodynamic analysis of synthetic hydrocarbon fuel production in pressurized solid oxide electrolysis cells	Sun et al. [79]	2012	120	10.00
Carbon deposition in solid oxide cells during Co-electrolysis of H_2O and CO_2	Tao et al. [80]	2014	100	10.00
Energy performance of Power-to-Liquid	Marchese et al.	2020	40	10.00

applications integrating biogas upgrading, reverse water gas shift, solid oxide electrolysis and Fischer-Tropsch technologies	[81]			
Influence of the oxygen electrode and inter-diffusion barrier on the degradation of solid oxide electrolysis cells	Hjalmarsson et al. [39]	2013	109	9.91
Integration of solid oxide electrolyzer and Fischer-Tropsch: A sustainable pathway for synthetic fuel	Cinti et al. [82]	2016	78	9.75
Intermediate-temperature solid oxide electrolysis cells with thin proton-conducting electrolyte and a robust air electrode	Lei et al. [40]	2017	68	9.71
Study of solid oxide electrolysis cells operated in potentiostatic mode: Effect of operating temperature on durability	Yang et al. [83]	2021	28	9.33
Syngas production on a symmetrical solid oxide H_2O/CO_2 coelectrolysis cell with $Sr_2Fe_{1.5}Mo_{0.5}O_6$-$Sm_{0.2}Ce_{0.8}O_{1.9}$ electrodes	Wang et al. [84]	2016	74	9.25
Average		2015.70	100.60	11.69

Table S6 Most cited articles about the proton-conducting SOECs on average per year excluding reviews

Title	Authors	Year	Total Citations	Average Citations per year
Hybrid-solid oxide electrolysis cell: A new strategy for efficient hydrogen production	Kim et al. [5]	2018	152	25.33
High performing triple-conductive $Pr_2NiO_{4+\delta}$ anode for proton-conducting steam solid oxide electrolysis cell	Li et al. [35]	2018	77	12.83
Electrochemical performance and stability of cobalt-free $Ln_{(12)}Sr_{(0.8)}NiO_{(4)}$ (Ln=La and Pr) air electrodes for proton-conducting reversible solid oxide cells	Yang et al. [85]	2018	71	11.83
High-yield electrochemical upgrading of CO_2 into CH_4 using large-area protonic ceramic electrolysis cells	Pan et al. [86]	2022	23	11.5
3D self-architectured steam electrode	Wu et al. [87]	2018	68	11.33

enabled efficient and durable hydrogen production in a proton-conducting solid oxide electrolysis cell at temperatures lower than 600 degrees C				
High-performing proton-conducting solid oxide fuel cells with triple-conducting cathode of $Pr_{0.5}Ba_{0.5}(Co_{0.7}Fe_{0.3})O_{3-\delta}$ tailored with W	Tao et al. [27]	2022	32	10.67
A new Dy-doped $BaCeO_3$-$BaZrO_3$ proton-conducting material as a promising electrolyte for reversible solid oxide fuel cells	Lyagaeva et al. [55]	2016	80	10
Y-doped $BaZrO_3$ as a chemically stable electrolyte for proton-conducting solid oxide electrolysis cells (SOECs)	Bi et al. [56]	2015	89	9.89
Intermediate-temperature solid oxide electrolysis cells with thin proton-conducting electrolyte and a robust air electrode	Lei et al. [40]	2017	68	9.71
Electrode performance and analysis of reversible solid oxide fuel cells with proton conducting electrolyte of $BaCe_{0.5}Zr_{0.3}Y_{0.2}O_{3-\delta}$	He et al. [57]	2010	122	8.71
First-principles design of new electrodes for proton-conducting solid-oxide electrochemical cells: A-site doped $Sr_2Fe_{1.5}Mo_{0.5}O_{6-\delta}$ perovskite	Munoz-Garcia et al. [88]	2016	66	8.25
Energy storage and hydrogen production by proton conducting solid oxide electrolysis cells with a novel heterogeneous design	Lei et al. [89]	2020	31	7.75
Doped (Nd,Ba)FeO_3 oxides as potential electrodes for symmetrically designed protonic ceramic electrochemical cells	Tarutina et al. [90]	2020	31	7.75
Synergistic coupling of proton conductors $BaZr_{0.1}Ce_{0.7}Y_{0.1}Yb_{0.1}O_{3-\delta}$ and $La_2Ce_2O_7$ to create chemical stable, interface active electrolyte for steam electrolysis cells	Li et al. [60]	2019	38	7.6
Tri-doped $BaCeO_3$-$BaZrO_3$ as a chemically stable electrolyte with high proton-conductivity for intermediate temperature solid oxide electrolysis	Rajendran et al. [61]	2020	28	7

cells (SOECs)				
Towards high-performance tubular-type protonic ceramic electrolysis cells with all-Ni-based functional electrodes	Tarutin et al. [91]	2020	28	7
Numerical analysis of mass and heat transport in proton-conducting SOFCs with direct internal reforming	Menon et al. [92]	2015	59	6.56
Computational design of cobalt-free mixed proton-electron conductors for solid oxide electrochemical cells	Munoz-Garcia et al. [93]	2017	42	6
Efficient intermediate-temperature steam electrolysis with Y : $SrZrO_3$-$SrCeO_3$ and Y : $BaZrO_3$-$BaCeO_3$ proton conducting perovskites	Leonard et al. [94]	2018	34	5.67
Average		2017.84	59.95	9.76

Table S7 Most cited articles about the modelling of SOECs on average per year excluding reviews

Title	Authors	Year	Total Citations	Average Citations per year
Co-electrolysis of CO_2 and H_2O in solid oxide cells: Performance and durability	Graves et al. [3]	2011	325	25
Large-scale electricity storage utilizing reversible solid oxide cells combined with underground storage of CO_2 and CH_4	Jensen et al. [12]	2015	196	21.78
Multi-objective optimization and comparative performance analysis of hybrid biomass-based solid oxide fuel cell/solid oxide electrolyzer cell/gas turbine using different gasification agents	Habibollahzade et al. [11]	2019	101	20.2
New optimal design for a hybrid solar chimney, solid oxide electrolysis and fuel cell based on improved deer hunting optimization algorithm	Tian et al. [95]	2020	76	19
A perspective on DRT applications for the analysis of solid oxide cell electrodes	Xia, Juan et al. [96]	2020	58	14.5
Techno-economic modelling of a Power-to-Gas system based on SOEC electrolysis and CO_2 methanation in a	Salomone et al. [97]	2019	69	13.8

RES-based electric grid				
Comparative life cycle assessment of electrochemical upgrading of CO_2 to fuels and feedstocks	Nabil et al. [98]	2021	39	13
Comparative study of alkaline water electrolysis, proton exchange membrane water electrolysis and solid oxide electrolysis through multiphysics modeling	Hu et al. [99]	2022	26	13
Solar hydrogen production: Techno-economic analysis of a parabolic dish-supported high-temperature electrolysis system	Mastropasqua et al. [100]	2020	51	12.75
Techno-economic analysis of current and emerging electrolysis technologies for green hydrogen production	Nami et al. [101]	2022	24	12
Hydrogen production through steam electrolysis: Model-based steady state performance of a cathode-supported intermediate temperature solid oxide electrolysis cell	Udagawa et al. [24]	2007	196	11.53
Modeling a novel combined solid oxide electrolysis cell (SOEC)—Biomass gasification renewable methanol production system	Ali et al. [77]	2020	44	11
Techno-economic analysis and Monte Carlo simulation of green hydrogen production technology through various water electrolysis technologies	Jang et al. [9]	2022	22	11
High-performing proton-conducting solid oxide fuel cells with triple-conducting cathode of $Pr_{0.5}Ba_{0.5}(Co_{0.7}Fe_{0.3})O_{3-\delta}$ tailored with W	Tao et al. [27]	2022	32	10.67
Enhancing electrochemical water-splitting kinetics by polarization-driven formation of near-surface iron(0): An *in situ* XPS study on perovskite-type electrodes	Opitz et al. [102]	2015	91	10.11
High-temperature electrolysis for large-scale hydrogen and syngas production from nuclear energy—summary of system simulation and economic analyses	O'Brien et al. [103]	2010	141	10.07
Energy performance of Power-to-Liquid	Marchese et al.	2020	40	10

applications integrating biogas upgrading, reverse water gas shift, solid oxide electrolysis and Fischer-Tropsch technologies	[81]			
Syngas production via high-temperature coelectrolysis of steam and carbon dioxide	Stoots et al. [104]	2009	149	9.93
Integration of solid oxide electrolyzer and Fischer-Tropsch: A sustainable pathway for synthetic fuel	Cinti et al. [82]	2016	78	9.75
Average		2017.37	92.53	13.64

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