

References

- [1] B. Petroleum, BP Statistical Review of World Energy, London, 2016.
- [2] D. Ehhalt, M. Prather, F. Dentener, R. Derwent, E.J. Dlugokencky, E. Holland, I. Isaksen, J. Katima, V. Kirchhoff, P. Matson, P. Midgley, M. Wang, T. Berntsen, I. Bey, G. Brasseur, L. Buja, W.J. Collins, J.S. Daniel, W.B. DeMore, N. Derek, R. Dickerson, D. Etheridge, J. Feichter, P. Fraser, R. Friedl, J. Fuglestvedt, M. Gauss, L. Grenfell, A. Grubler, N. Harris, D. Hauglustaine, L. Horowitz, C. Jackman, D. Jacob, L. Jaegle, A.K. Jain, M. Kanakidou, S. Karlsdottir, M. Ko, M. Kurylo, M. Lawrence, J.A. Logan, M. Manning, D. Mauzerall, J. McConnell, L.J. Mickley, S. Montzka, J.F. Muller, J. Olivier, K. Pickering, G. Pitari, G.J. Roelofs, H. Rogers, B. Rognerud, S.J. Smith, S. Solomon, J. Staehelin, P. Steele, D.S. Stevenson, J. Sundet, A. Thompson, M. van Weele, R. von Kuhlmann, Y. Wang, D.K. Weisenstein, T.M. Wigley, O. Wild, D.J. Wuebbles, R. Yantosca, F. Joos, M. McFarland, Atmospheric Chemistry and Greenhouse Gases, Houghton, J. T. et al; Cambridge University Press, Cambridge, United Kingdom., United States, 2001.
- [3] M.M. Halmann, M. Steinberg, Greenhouse gas carbon dioxide mitigation: science and technology, CRC press 1998.
- [4] J.M. Duxbury, The significance of agricultural sources of greenhouse gases, Fertilizer research, 38 (1994) 151-163.
- [5] O. Okoro, T. Madueme, Solar energy investments in a developing economy, Renewable Energy, 29 (2004) 1599-1610.
- [6] A. Demirbas, Global renewable energy projections, Energy Sources, Part B, 4 (2009) 212-224.

- [7] S. Luthra, K. Govindan, R.K. Kharb, S.K. Mangla, Evaluating the enablers in solar power developments in the current scenario using fuzzy DEMATEL: An Indian perspective, *Renewable and Sustainable Energy Reviews*, 63 (2016) 379-397.
- [8] G.W. Crabtree, N.S. Lewis, Solar energy conversion, *Physics today*, 60 (2007) 37-42.
- [9] S. Mekhilef, R. Saidur, A. Safari, A review on solar energy use in industries, *Renewable and sustainable energy reviews*, 15 (2011) 1777-1790.
- [10] J.J. Reilly, G.D. Sandrock, Hydrogen storage in metal hydrides, *Scientific American*, 242 (1980) 118-131.
- [11] G.W. Crabtree, M.S. Dresselhaus, M.V. Buchanan, The hydrogen economy, *Physics today*, 57 (2004) 39-44.
- [12] M. Hirscher, Handbook of hydrogen storage, *Topics in applied physics*, 12 (2010).
- [13] D.P. Nolan, Chapter 4 - Physical Properties of Hydrocarbons and Petrochemicals, in: D.P. Nolan (Ed.) *Handbook of Fire and Explosion Protection Engineering Principles for Oil, Gas, Chemical, and Related Facilities (Fourth Edition)*, Gulf Professional Publishing 2019, pp. 65-88.
- [14] J.G. Speight, Chapter 9 - Chemical and Physical Properties of Hydrocarbons, in: J.G. Speight (Ed.) *Handbook of Industrial Hydrocarbon Processes*, Gulf Professional Publishing, Boston, 2011, pp. 325-353.
- [15] G.A. Karim, Hydrogen as a spark ignition engine fuel, *International Journal of Hydrogen Energy*, 28 (2003) 569-577.
- [16] J.R. Rostrup-Nielsen, Catalytic steam reforming, *Catalysis*, Springer 1984, pp. 1-117.
- [17] P.D. Vaidya, A.E. Rodrigues, Insight into steam reforming of ethanol to produce hydrogen for fuel cells, *Chemical Engineering Journal*, 117 (2006) 39-49.

- [18] F. Frusteri, S. Freni, L. Spadaro, V. Chiodo, G. Bonura, S. Donato, S. Cavallaro, H₂ production for MC fuel cell by steam reforming of ethanol over MgO supported Pd, Rh, Ni and Co catalysts, *Catalysis Communications*, 5 (2004) 611-615.
- [19] Y. Chen, P. Cui, G. Xiong, H. Xu, Novel nickel-based catalyst for low temperature hydrogen production from methane steam reforming in membrane reformer, *Asia-Pacific Journal of Chemical Engineering*, 5 (2010) 93-100.
- [20] A. Ashcroft, A.K. Cheetham, M. Green, P. Vernon, Partial oxidation of methane to synthesis gas using carbon dioxide, *Nature*, 352 (1991) 225.
- [21] K.L. Agee, Apparatus for the production of heavier hydrocarbons from gaseous light hydrocarbons, Google Patents, 1990.
- [22] W. Cai, F. Wang, E. Zhan, A. Van Veen, C. Mirodatos, W. Shen, Hydrogen production from ethanol over Ir/CeO₂ catalysts: a comparative study of steam reforming, partial oxidation and oxidative steam reforming, *Journal of Catalysis*, 257 (2008) 96-107.
- [23] J. Kugai, V. Subramani, C. Song, M.H. Engelhard, Y.-H. Chin, Effects of nanocrystalline CeO₂ supports on the properties and performance of Ni–Rh bimetallic catalyst for oxidative steam reforming of ethanol, *Journal of Catalysis*, 238 (2006) 430-440.
- [24] A. Ashcroft, A. Cheetham, J.a. Foord, M. Green, C. Grey, A. Murrell, P. Vernon, Selective oxidation of methane to synthesis gas using transition metal catalysts, *Nature*, 344 (1990) 319.
- [25] I. Dincer, Green methods for hydrogen production, *International journal of hydrogen energy*, 37 (2012) 1954-1971.

- [26] H. Hennig, R. Billing, Advantages and disadvantages of photocatalysis induced by light-sensitive coordination compounds, *Coordination Chemistry Reviews*, 125 (1993) 89-100.
- [27] R.P. Sinha, D.P. Häder, Photobiology and ecophysiology of rice field cyanobacteria, *Photochemistry and Photobiology*, 64 (1996) 887-896.
- [28] C.N. Dasgupta, J.J. Gilbert, P. Lindblad, T. Heidorn, S.A. Borgvang, K. Skjanes, D. Das, Recent trends on the development of photobiological processes and photobioreactors for the improvement of hydrogen production, *International Journal of Hydrogen Energy*, 35 (2010) 10218-10238.
- [29] I. Akkerman, M. Janssen, J. Rocha, R.H. Wijffels, Photobiological hydrogen production: photochemical efficiency and bioreactor design, *International journal of hydrogen energy*, 27 (2002) 1195-1208.
- [30] L.E. Nagy, J.E. Meuser, S. Plummer, M. Seibert, M.L. Ghirardi, P.W. King, D. Ahmann, M.C. Posewitz, Application of gene-shuffling for the rapid generation of novel [FeFe]-hydrogenase libraries, *Biotechnology Letters*, 29 (2007) 421-430.
- [31] R. Abe, M. Higashi, K. Domen, Facile fabrication of an efficient oxynitride TaON photoanode for overall water splitting into H₂ and O₂ under visible light irradiation, *Journal of the American Chemical Society*, 132 (2010) 11828-11829.
- [32] A. Mishra, S. Basu, N.P. Shetti, K.R. Reddy, T.M. Aminabhavi, Chapter 27 - Photocatalysis of Graphene and Carbon Nitride-Based Functional Carbon Quantum Dots, in: S. Thomas, D. Pasquini, S.-Y. Leu, D.A. Gopakumar (Eds.) *Nanoscale Materials in Water Purification*, Elsevier 2019, pp. 759-781.
- [33] J. Juodkazytė, G. Seniutinas, B. Šebeka, I. Savickaja, T. Malinauskas, K. Badokas, K. Juodkazis, S. Juodkazis, Solar water splitting: efficiency discussion, *International Journal of Hydrogen Energy*, 41 (2016) 11941-11948.

- [34] A. Gedamu, J. Rick, A. Aregahegn, w.-n. su, B.J. Hwang, C.-J. Pan, Using hematite for photocatalytic water splitting a review of current developments and challenges, 2016.
- [35] Y. Wu, M. Chan, G. Ceder, Prediction of semiconductor band edge positions in aqueous environments from first principles, *Physical Review B*, 83 (2011) 235301.
- [36] D.H. Taffa, R. Dillert, A.C. Ulpe, K.C. Bauerfeind, T. Bredow, D.W. Bahnemann, M. Wark, Photoelectrochemical and theoretical investigations of spinel type ferrites ($M_x Fe_{3-x} O_4$) for water splitting: a mini-review, *Journal of Photonics for Energy*, 7 (2016) 012009.
- [37] A.W. Bott, Electrochemistry of semiconductors, *Current Separations*, 17 (1998) 87-92.
- [38] C.A. Koval, J.N. Howard, Electron transfer at semiconductor electrode-liquid electrolyte interfaces, *Chemical Reviews*, 92 (1992) 411-433.
- [39] P. Yimsiri, M. Mackley, Spin and dip coating of light-emitting polymer solutions: Matching experiment with modelling, *Chemical Engineering Science*, 61 (2006) 3496-3505.
- [40] U. Selvaraj, A.V. Prasadarao, S. Komarneni, R. Roy, Sol-gel fabrication of epitaxial and oriented TiO_2 thin films, *Journal of the American Ceramic Society*, 75 (1992) 1167-1170.
- [41] P.S. Shinde, P.R. Fontenot, J.P. Donahue, J.L. Waters, P. Kung, L.E. McNamara, N.I. Hammer, A. Gupta, S. Pan, Synthesis of MoS_2 from $[Mo_3S_7(S_2CNEt_2)_3]I$ for enhancing photoelectrochemical performance and stability of Cu_2O photocathode toward efficient solar water splitting, *Journal of Materials Chemistry A*, 6 (2018) 9569-9582.

- [42] N.F. Ramli, P.N.A. Fahsyar, N.A. Ludin, M.A.M. Teridi, M.A. Ibrahim, S.H. Zaidi, S. Sepeai, Compatibility Between Compact and Mesoporous TiO₂ Layers on the Optimization of Photocurrent Density in Photoelectrochemical Cells, *Surfaces and Interfaces*, (2019) 100341.
- [43] B.R. Sankapal, R.S. Mane, C.D. Lokhande, Successive ionic layer adsorption and reaction (SILAR) method for the deposition of large area (~10 cm²) tin disulfide (SnS₂) thin films, *Materials Research Bulletin*, 35 (2000) 2027-2035.
- [44] H.M. Pathan, C.D. Lokhande, Deposition of metal chalcogenide thin films by successive ionic layer adsorption and reaction (SILAR) method, *Bulletin of Materials Science*, 27 (2004) 85-111.
- [45] R. Yin, M. Liu, R. Tang, L. Yin, CdS Nanoparticle-Modified α -Fe₂O₃/TiO₂ Nanorod Array Photoanode for Efficient Photoelectrochemical Water Oxidation, *Nanoscale Research Letters*, 12 (2017) 520.
- [46] K. Adaikalam, N. Ambika, M. R. Kim, J. Elanchezhian, Y. Chae, J. K. Rhee, Chemical bath deposition and characterization of nanocrystalline ZnO thin films, 2010.
- [47] P.K. Nair, M.T.S. Nair, V.M. García, O.L. Arenas, A.C.Y. Peña, I.T. Ayala, O. Gomezdaza, A. Sánchez, J. Campos, H. Hu, R. Suárez, M.E. Rincón, Semiconductor thin films by chemical bath deposition for solar energy related applications, *Solar Energy Materials and Solar Cells*, 52 (1998) 313-344.
- [48] Y. Liu, Y.-X. Yu, W.-D. Zhang, MoS₂/CdS Heterojunction with High Photoelectrochemical Activity for H₂ Evolution under Visible Light: The Role of MoS₂, *The Journal of Physical Chemistry C*, 117 (2013) 12949-12957.
- [49] J. Xie, J. Zhang, S. Li, F. Grote, X. Zhang, H. Zhang, R. Wang, Y. Lei, B. Pan, Y. Xie, Controllable Disorder Engineering in Oxygen-Incorporated MoS₂ Ultrathin

Nanosheets for Efficient Hydrogen Evolution, *Journal of the American Chemical Society*, 135 (2013) 17881-17888.

[50] K.-J. Huang, L. Wang, J.-Z. Zhang, K. Xing, Synthesis of molybdenum disulfide/carbon aerogel composites for supercapacitors electrode material application, 2015.

[51] C. Kim, J.T. Kim, K.S. Kim, S. Jeong, H.Y. Kim, Y.S. Han, Immobilization of TiO₂ on an ITO substrate to facilitate the photoelectrochemical degradation of an organic dye pollutant, *Electrochimica Acta*, 54 (2009) 5715-5720.

[52] I. Rodríguez-Gutiérrez, E. Djatoubai, M. Rodríguez-Pérez, J. Su, G. Rodríguez-Gattorno, L. Vayssieres, G. Oskam, Photoelectrochemical water oxidation at FTO|WO₃@CuWO₄ and FTO|WO₃@CuWO₄|BiVO₄ heterojunction systems: An IMPS analysis, *Electrochimica Acta*, 308 (2019) 317-327.

[53] K. Zarębska, T. Łęcki, M. Skompska, Synthesis of CdSe on FTO-supported ZnO nanorods by SILAR and electrochemical methods and comparison of photoelectrochemical properties of FTO/ZnO/CdSe systems in aqueous S²⁻/Sn²⁻ electrolyte, *Journal of Electroanalytical Chemistry*, 819 (2018) 459-468.

[54] Z. Peimanifard, S. Rashid-Nadimi, Glassy carbon/multi walled carbon nanotube/cadmium sulphide photoanode for light energy storage in vanadium photoelectrochemical cell, *Journal of Power Sources*, 300 (2015) 395-401.

[55] X.-L. Wu, A.-W. Xu, Carbonaceous hydrogels and aerogels for supercapacitors, *Journal of Materials Chemistry A*, 2 (2014) 4852-4864.

[56] R. Li, C. Li, Chapter One - Photocatalytic Water Splitting on Semiconductor-Based Photocatalysts, in: C. Song (Ed.) *Advances in Catalysis*, Academic Press 2017, pp. 1-57.

- [57] K.G.U. Wijayantha, D.H. Auty, M.S.H. Bhuiyan, Twin Cell Technology for Hydrogen Generation, Reference Module in Materials Science and Materials Engineering, Elsevier 2016.
- [58] J. Schneider, D.W. Bahnemann, Undesired Role of Sacrificial Reagents in Photocatalysis, *The Journal of Physical Chemistry Letters*, 4 (2013) 3479-3483.
- [59] N. Buehler, K. Meier, J.F. Reber, Photochemical hydrogen production with cadmium sulfide suspensions, *The Journal of Physical Chemistry*, 88 (1984) 3261-3268.
- [60] Chapter 1 History of catalysis, in: J.A. Moulijn, P.W.N.M. van Leeuwen, R.A. van Santen (Eds.) *Studies in Surface Science and Catalysis*, Elsevier 1993, pp. 3-21.
- [61] W.T. Grubb, High-performance Propane Fuel Cells, *Nature*, 201 (1964) 699-700.
- [62] H.J. Lewerenz, C. Heine, K. Skorupska, N. Szabo, T. Hannappel, T. Vo-Dinh, S.A. Campbell, H.W. Klemm, A.G. Muñoz, Photoelectrocatalysis: principles, nanoemitter applications and routes to bio-inspired systems, *Energy & Environmental Science*, 3 (2010) 748-760.
- [63] S.J. Klebanoff, Microbicidal Mechanisms, Oxygen-Dependent, in: P.J. Delves (Ed.) *Encyclopedia of Immunology (Second Edition)*, Elsevier, Oxford, 1998, pp. 1713-1718.
- [64] H.L. Tan, F.F. Abdi, Y.H. Ng, Heterogeneous photocatalysts: an overview of classic and modern approaches for optical, electronic, and charge dynamics evaluation, *Chemical Society Reviews*, 48 (2019) 1255-1271.
- [65] A. Fujishima, K. Honda, Electrochemical Photolysis of Water at a Semiconductor Electrode, *Nature*, 238 (1972) 37-38.
- [66] D.P. Mohapatra, S.K. Brar, R. Dagher, R.D. Tyagi, P. Picard, R.Y. Surampalli, P. Drogui, Photocatalytic degradation of carbamazepine in wastewater by using a new

class of whey-stabilized nanocrystalline TiO₂ and ZnO, *Science of The Total Environment*, 485-486 (2014) 263-269.

[67] H.M.A. Hamid, Z. Çelik-Butler, Characterization and performance analysis of Li-doped ZnO nanowire as a nano-sensor and nano-energy harvesting element, *Nano Energy*, 50 (2018) 159-168.

[68] K. Sekizawa, K. Oh-ishi, K. Kataoka, T. Arai, T.M. Suzuki, T. Morikawa, Stoichiometric water splitting using a p-type Fe₂O₃ based photocathode with the aid of a multi-heterojunction, *Journal of Materials Chemistry A*, 5 (2017) 6483-6493.

[69] C.P. Poole, R. Prozorov, H.A. Farach, R.J. Creswick, 1 - Properties of the normal state, in: C.P. Poole, R. Prozorov, H.A. Farach, R.J. Creswick (Eds.) *Superconductivity (Third Edition)*, Elsevier, London, 2014, pp. 1-31.

[70] Y. Zhong, X. Xia, F. Shi, J. Zhan, J. Tu, H.J. Fan, Transition Metal Carbides and Nitrides in Energy Storage and Conversion, *Adv Sci (Weinh)*, 3 (2016) 1500286-1500286.

[71] N. Han, P. Liu, J. Jiang, L. Ai, Z. Shao, S. Liu, Recent advances in nanostructured metal nitrides for water splitting, *Journal of Materials Chemistry A*, 6 (2018) 19912-19933.

[72] T. Palacios, U.K. Mishra, G.K. Sujan, GaN-Based Transistors for High-Frequency Applications, *Reference Module in Materials Science and Materials Engineering*, Elsevier 2016.

[73] M.R. Hillis, C. Kemball, M.W. Roberts, Synthesis of ammonia and related processes on reduced molybdenum dioxide, *Transactions of the Faraday Society*, 62 (1966) 3570-3585.

- [74] J.N. Musher, R.G. Gordon, Atmospheric pressure chemical vapor deposition of TiN from tetrakis(dimethylamido)titanium and ammonia, *Journal of Materials Research*, 11 (2011) 989-1001.
- [75] F. Yu, H. Zhou, Y. Huang, J. Sun, F. Qin, J. Bao, W.A. Goddard, S. Chen, Z. Ren, High-performance bifunctional porous non-noble metal phosphide catalyst for overall water splitting, *Nature Communications*, 9 (2018) 2551.
- [76] Y. Li, J.-G. Wang, Y. Fan, H. Sun, W. Hua, H. Liu, B. Wei, Plasmonic TiN boosting nitrogen-doped TiO₂ for ultrahigh efficient photoelectrochemical oxygen evolution, *Applied Catalysis B: Environmental*, 246 (2019) 21-29.
- [77] Y.-J. Song, Z.-Y. Yuan, One-pot Synthesis of Mo₂N/NC Catalysts with Enhanced Electrocatalytic Activity for Hydrogen Evolution Reaction, *Electrochimica Acta*, 246 (2017) 536-543.
- [78] N. Qutub, B.M. Pirzada, K. Umar, S. Sabir, Synthesis of CdS nanoparticles using different sulfide ion precursors: Formation mechanism and photocatalytic degradation of Acid Blue-29, *Journal of Environmental Chemical Engineering*, 4 (2016) 808-817.
- [79] Y. Yang, W. Zhang, Y. Xu, H. Sun, Preparation of PbS and CdS cosensitized graphene/TiO₂ nanosheets for photoelectrochemical protection of 304 stainless steels, *Applied Surface Science*, 452 (2018) 58-66.
- [80] Y. Jiang, Q. Wang, L. Han, X. Zhang, L. Jiang, Z. Wu, Y. Lai, D. Wang, F. Liu, Construction of In₂Se₃/MoS₂ heterojunction as photoanode toward efficient photoelectrochemical water splitting, *Chemical Engineering Journal*, 358 (2019) 752-758.
- [81] Y. Zhou, X. Fan, G. Zhang, W. Dong, Fabricating MoS₂ nanoflakes photoanode with unprecedented high photoelectrochemical performance and multi-pollutants

- degradation test for water treatment, *Chemical Engineering Journal*, 356 (2019) 1003-1013.
- [82] N.D. Quang, T.T. Hien, N.D. Chinh, D. Kim, C. Kim, D. Kim, Transport of photo-generated electrons and holes in TiO₂/CdS/CdSe core-shell nanorod structure toward high performance photoelectrochemical cell electrode, *Electrochimica Acta*, 295 (2019) 710-718.
- [83] W. Kim, D. Monllor-Satoca, W.-S. Chae, M.A. Mahadik, J.S. Jang, Enhanced photoelectrochemical and hydrogen production activity of aligned CdS nanowire with anisotropic transport properties, *Applied Surface Science*, 463 (2019) 339-347.
- [84] J. Wang, K. Zhang, H. Xu, B. Yan, F. Gao, Y. Shi, Y. Du, Engineered photoelectrochemical platform for the ultrasensitive detection of caffeic acid based on flower-like MoS₂ and PANI nanotubes nanohybrid, *Sensors and Actuators B: Chemical*, 276 (2018) 322-330.
- [85] X. Li, H. Liu, S. Liu, J. Zhang, W. Chen, C. Huang, L. Mao, Effect of Pt-Pd hybrid nano-particle on CdS's activity for water splitting under visible light, *International Journal of Hydrogen Energy*, 41 (2016) 23015-23021.
- [86] C.M. Farley, C. Uyeda, *Organic Reactions Enabled by Catalytically Active Metal-Metal Bonds*, *Trends in Chemistry*, (2019).
- [87] X. Ma, H. Sun, Y. Wang, X. Wu, J. Zhang, Electronic and optical properties of strained noble metals: Implications for applications based on LSPR, *Nano Energy*, 53 (2018) 932-939.
- [88] H. Lee, J. Jeong, Y. Yi, H. Lee, Electronic structure and Fermi-level pinning of indigo for application in environment-friendly devices, *Applied Surface Science*, 484 (2019) 808-813.

- [89] Y. Chang, Y. Xuan, C. Zhang, H. Hao, K. Yu, S. Liu, Z-Scheme Pt@CdS/3DOM-SrTiO₃ composite with enhanced photocatalytic hydrogen evolution from water splitting, *Catalysis Today*, 327 (2019) 315-322.
- [90] B. Zhang, H. Wang, F. Zhao, B. Zeng, LED visible-light driven label-free photoelectrochemical immunosensor based on WO₃/Au/CdS photocatalyst for the sensitive detection of carcinoembryonic antigen, *Electrochimica Acta*, 297 (2019) 372-380.
- [91] L. Wang, W. Gu, P. Sheng, Z. Zhang, B. Zhang, Q. Cai, A label-free cytochrome c photoelectrochemical aptasensor based on CdS/CuInS₂/Au/TiO₂ nanotubes, *Sensors and Actuators B: Chemical*, 281 (2019) 1088-1096.
- [92] Y. Zhao, J. Gong, X. Zhang, R. Kong, F. Qu, Enhanced biosensing platform constructed using urchin-like ZnO-Au@CdS microspheres based on the combination of photoelectrochemical and bioetching strategies, *Sensors and Actuators B: Chemical*, 255 (2018) 1753-1761.
- [93] J.S. Lee, Photocatalytic water splitting under visible light with particulate semiconductor catalysts, *Catalysis Surveys from Asia*, 9 (2005) 217-227.
- [94] K. Zhang, L. Jin, Y. Yang, K. Guo, F. Hu, Novel method of constructing CdS/ZnS heterojunction for high performance and stable photocatalytic activity, *Journal of Photochemistry and Photobiology A: Chemistry*, 380 (2019) 111859.
- [95] S. Chaguetmi, L. Chaperman, S. Nowak, D. Schaming, S. Lau-Truong, P. Decorse, P. Beaunier, C. Costentin, F. Mammeri, S. Achour, S. Ammar, Photoelectrochemical properties of ZnS- and CdS-TiO₂ nanostructured photocatalysts: Aqueous sulfidation as a smart route to improve catalyst stability, *Journal of Photochemistry and Photobiology A: Chemistry*, 356 (2018) 489-501.

- [96] J. Ji, L. Guo, Q. Li, F. Wang, Z. Li, J. Liu, Y. Jia, A bifunctional catalyst for hydrogen evolution reaction: The interactive influences between CdS and MoS₂ on photoelectrochemical activity, *International Journal of Hydrogen Energy*, 40 (2015) 3813-3821.
- [97] N.d.D. Diby, Y. Duan, P.A. Grah, F. Cai, Z. Yuan, Enhanced photoelectrochemical water-splitting performance of TiO₂ nanorods sensitized with CdS via hydrothermal approach, *Journal of Alloys and Compounds*, 803 (2019) 456-465.
- [98] Y. Zhong, S. Yang, S. Zhang, X. Cai, Q. Gao, X. Yu, Y. Xu, X. Zhou, F. Peng, Y. Fang, CdS branched TiO₂: Rods-on-rods nanoarrays for efficient photoelectrochemical (PEC) and self-bias photocatalytic (PC) hydrogen production, *Journal of Power Sources*, 430 (2019) 32-42.
- [99] X. Liu, X. Huo, P. Liu, Y. Tang, J. Xu, X. Liu, Y. Zhou, Assembly of MoS₂ nanosheet-TiO₂ nanorod heterostructure as sensor scaffold for photoelectrochemical biosensing, *Electrochimica Acta*, 242 (2017) 327-336.
- [100] X. Jiang, Y. Song, M. Dou, J. Ji, F. Wang, Selective growth of vertically aligned two-dimensional MoS₂/WS₂ nanosheets with decoration of Bi₂S₃ nanorods by microwave-assisted hydrothermal synthesis: Enhanced photo- and electrochemical performance for hydrogen evolution reaction, *International Journal of Hydrogen Energy*, 43 (2018) 21290-21298.
- [101] M.J. Allen, V.C. Tung, R.B. Kaner, Honeycomb carbon: a review of graphene, *Chemical reviews*, 110 (2009) 132-145.
- [102] D. Malko, C. Neiss, F. Vines, A. Görling, Competition for graphene: graphynes with direction-dependent dirac cones, *Physical review letters*, 108 (2012) 086804.

- [103] W. Mönch, Electronic Properties of Semiconductor Interfaces, in: S. Kasap, P. Capper (Eds.) Springer Handbook of Electronic and Photonic Materials, Springer International Publishing, Cham, 2017, pp. 1-1.
- [104] H. Liu, Y. Liu, D. Zhu, Chemical doping of graphene, *Journal of Materials Chemistry*, 21 (2011) 3335-3345.
- [105] G. Wang, B. Wang, J. Park, J. Yang, X. Shen, J. Yao, Synthesis of enhanced hydrophilic and hydrophobic graphene oxide nanosheets by a solvothermal method, *Carbon*, 47 (2009) 68-72.
- [106] V. Georgakilas, M. Otyepka, A. B Bourlinos, V. Chandra, N. Kim, K. Kemp, P. Hobza, R. Zboril, K. Kim, Functionalization of Graphene: Covalent and Non-Covalent Approaches, Derivatives and Applications, 2012.
- [107] A.S. Tayi, A.K. Shveyd, A.C.-H. Sue, J.M. Szarko, B.S. Rolczynski, D. Cao, T.J. Kennedy, A.A. Sarjeant, C.L. Stern, W.F. Paxton, Room-temperature ferroelectricity in supramolecular networks of charge-transfer complexes, *Nature*, 488 (2012) 485.
- [108] X. Mei, J. Ouyang, Ultrasonication-assisted ultrafast reduction of graphene oxide by zinc powder at room temperature, *Carbon*, 49 (2011) 5389-5397.
- [109] Z. Zhang, H. Chen, C. Xing, M. Guo, F. Xu, X. Wang, H.J. Gruber, B. Zhang, J. Tang, Sodium citrate: a universal reducing agent for reduction/decoration of graphene oxide with au nanoparticles, *Nano Research*, 4 (2011) 599-611.
- [110] J. Zhang, H. Yang, G. Shen, P. Cheng, J. Zhang, S. Guo, Reduction of graphene oxide via L-ascorbic acid, *Chemical Communications*, 46 (2010) 1112-1114.
- [111] S. Sarkar, D. Basak, The reduction of graphene oxide by zinc powder to produce a zinc oxide-reduced graphene oxide hybrid and its superior photocatalytic activity, *Chemical Physics Letters*, 561-562 (2013) 125-130.

- [112] S. Park, R.S. Ruoff, Synthesis and characterization of chemically modified graphenes, *Current Opinion in Colloid & Interface Science*, 20 (2015) 322-328.
- [113] C.K. Chua, A. Ambrosi, M. Pumera, Graphene based nanomaterials as electrochemical detectors in Lab-on-a-chip devices, *Electrochemistry Communications*, 13 (2011) 517-519.
- [114] K.K.H. De Silva, H.-H. Huang, M. Yoshimura, Progress of reduction of graphene oxide by ascorbic acid, *Applied Surface Science*, 447 (2018) 338-346.
- [115] A. Ngqalakwezi, D. Nkazi, G. Seifert, T. Ntho, Effects of reduction of graphene oxide on the hydrogen storage capacities of metal graphene nanocomposite, *Catalysis Today*, (2019).
- [116] D.R. Dreyer, S. Park, C.W. Bielawski, R.S. Ruoff, The chemistry of graphene oxide, *Chemical society reviews*, 39 (2010) 228-240.
- [117] M.J. McAllister, J.-L. Li, D.H. Adamson, H.C. Schniepp, A.A. Abdala, J. Liu, M. Herrera-Alonso, D.L. Milius, R. Car, R.K. Prud'homme, Single sheet functionalized graphene by oxidation and thermal expansion of graphite, *Chemistry of materials*, 19 (2007) 4396-4404.
- [118] Z. Ji, X. Shen, G. Zhu, H. Zhou, A. Yuan, Reduced graphene oxide/nickel nanocomposites: facile synthesis, magnetic and catalytic properties, *Journal of Materials Chemistry*, 22 (2012) 3471-3477.
- [119] G. Williams, B. Seger, P.V. Kamat, TiO₂-Graphene Nanocomposites. UV-Assisted Photocatalytic Reduction of Graphene Oxide, *ACS Nano*, 2 (2008) 1487-1491.
- [120] Z. Wang, X. Zhou, J. Zhang, F. Boey, H. Zhang, Direct electrochemical reduction of single-layer graphene oxide and subsequent functionalization with glucose oxidase, *The Journal of Physical Chemistry C*, 113 (2009) 14071-14075.

- [121] M. Pumera, Graphene-based nanomaterials and their electrochemistry, *Chemical Society Reviews*, 39 (2010) 4146-4157.
- [122] J. Zhao, L. Liu, F. Li, Fabrication and Reduction, *Graphene Oxide: Physics and Applications*, Springer 2015, pp. 1-13.
- [123] L. Sun, H. Yu, B. Fugetsu, Graphene oxide adsorption enhanced by in situ reduction with sodium hydrosulfite to remove acridine orange from aqueous solution, *Journal of hazardous materials*, 203 (2012) 101-110.
- [124] J. Tang, P. Xiong, Y. Cheng, Y. Chen, S. Peng, Z.-Q. Zhu, Enzymatic oxydate-triggered AgNPs etching: A novel signal-on photoelectrochemical immunosensing platform based on Ag@AgCl nanocubes loaded RGO plasmonic heterostructure, *Biosensors and Bioelectronics*, 130 (2019) 125-131.
- [125] M. Cobos, B. González, M.J. Fernández, M.D. Fernández, Study on the effect of graphene and glycerol plasticizer on the properties of chitosan-graphene nanocomposites via in situ green chemical reduction of graphene oxide, *International Journal of Biological Macromolecules*, 114 (2018) 599-613.
- [126] P. Yu, Z.-C. Xiao, Q.-Y. Wang, J.-K. Pei, Y.-H. Niu, R.-Y. Bao, Y. Wang, M.-B. Yang, W. Yang, Advanced Graphene@Sulfur composites via an in-situ reduction and wrapping strategy for high energy density lithium–sulfur batteries, *Carbon*, 150 (2019) 224-232.
- [127] J. Chen, Y. Hu, X. Tan, L. Zhang, W. Huang, J. Sun, Enhanced performance of microbial fuel cell with in situ preparing dual graphene modified bioelectrode, *Bioresource Technology*, 241 (2017) 735-742.
- [128] H. Chang, X. Lv, H. Zhang, J. Li, Quantum dots sensitized graphene: In situ growth and application in photoelectrochemical cells, *Electrochemistry Communications*, 12 (2010) 483-487.

- [129] Y. Hong, P. Shi, P. Wang, W. Yao, Improved photocatalytic activity of CdS/reduced graphene oxide (RGO) for H₂ evolution by strengthening the connection between CdS and RGO sheets, *International Journal of Hydrogen Energy*, 40 (2015) 7045-7051.
- [130] N. Zhang, Y. Zhang, X. Pan, M.-Q. Yang, Y.-J. Xu, Constructing Ternary CdS–Graphene–TiO₂ Hybrids on the Flatland of Graphene Oxide with Enhanced Visible-Light Photoactivity for Selective Transformation, *The Journal of Physical Chemistry C*, 116 (2012) 18023-18031.
- [131] H. Wu, M. Xu, P. Da, W. Li, D. Jia, G. Zheng, WO₃–reduced graphene oxide composites with enhanced charge transfer for photoelectrochemical conversion, *Physical Chemistry Chemical Physics*, 15 (2013) 16138-16142.
- [132] M.M. Khan, Chapter 14 - Metal Oxide–Graphene and Metal–Graphene Nanocomposites for Energy and Environment, in: M. Jawaid, R. Bouhfid, A.e. Kacem Qaiss (Eds.) *Functionalized Graphene Nanocomposites and their Derivatives*, Elsevier 2019, pp. 285-294.
- [133] B. Wang, Z. Liu, J. Han, T. Hong, J. Zhang, Y. Li, T. Cui, Hierarchical graphene/CdS/Ag₂S sandwiched nanofilms for photoelectrochemical water splitting, *Electrochimica Acta*, 176 (2015) 334-343.
- [134] W. Han, L. Chen, W. Song, S. Wang, X. Fan, Y. Li, F. Zhang, G. Zhang, W. Peng, Synthesis of nitrogen and sulfur co-doped reduced graphene oxide as efficient metal-free cocatalyst for the photo-activity enhancement of CdS, *Applied Catalysis B: Environmental*, 236 (2018) 212-221.
- [135] Q. Shen, X. Shi, M. Fan, L. Han, L. Wang, Q. Fan, Highly sensitive photoelectrochemical cysteine sensor based on reduced graphene oxide/CdS:Mn nanocomposites, *Journal of Electroanalytical Chemistry*, 759 (2015) 61-66.

- [136] W. Xiao, Y. Zhang, L. Tian, H. Liu, B. Liu, Y. Pu, Facile synthesis of reduced graphene oxide/titania composite hollow microspheres based on sonication-assisted interfacial self-assembly of tiny graphene oxide sheets and the photocatalytic property, *Journal of Alloys and Compounds*, 665 (2016) 21-30.
- [137] H.-X. Wang, R. Wu, S.-H. Wei, L.-R. Yu, J.-K. Jian, J. Hou, J. Wang, H.-Y. Zhang, Y.-F. Sun, One-pot solvothermal synthesis of ZnTe/RGO nanocomposites and enhanced visible-light photocatalysis, *Chinese Chemical Letters*, 27 (2016) 1572-1576.
- [138] T. Ohta, T.N. Veziroglu, Hydrogen production using solar radiation, *International Journal of Hydrogen Energy*, 1 (1976) 255-263.
- [139] N. Gross, Y.-Y. Sun, S. Perera, H. Hui, X. Wei, S. Zhang, H. Zeng, B. Weinstein, Stability and Band-Gap Tuning of the Chalcogenide Perovskite BaZrS₃ in Raman and Optical Investigations at High Pressures, 2017.
- [140] S.V. Kershaw, A.S. Susha, A.L. Rogach, Narrow bandgap colloidal metal chalcogenide quantum dots: synthetic methods, heterostructures, assemblies, electronic and infrared optical properties, *Chemical Society Reviews*, 42 (2013) 3033-3087.
- [141] S. Aminorroaya Yamini, V. Patterson, R. Santos, Band-Gap Nonlinearity in Lead Chalcogenide (PbQ, Q = Te, Se, S) Alloys, *ACS Omega*, 2 (2017) 3417-3423.
- [142] K.W. Böer, Cadmium sulfide enhances solar cell efficiency, *Energy Conversion and Management*, 52 (2011) 426-430.
- [143] H.-W. Tseng, M.B. Wilker, N.H. Damrauer, G. Dukovic, Charge Transfer Dynamics between Photoexcited CdS Nanorods and Mononuclear Ru Water-Oxidation Catalysts, *Journal of the American Chemical Society*, 135 (2013) 3383-3386.
- [144] J. Yang, D. Wang, H. Han, C. Li, Roles of Cocatalysts in Photocatalysis and Photoelectrocatalysis, *Accounts of Chemical Research*, 46 (2013) 1900-1909.

- [145] Y. Nakibli, Y. Mazal, Y. Dubi, M. Wächtler, L. Amirav, Size Matters: Cocatalyst Size Effect on Charge Transfer and Photocatalytic Activity, *Nano Letters*, 18 (2018) 357-364.
- [146] H. Ahmad, S.K. Kamarudin, L.J. Minggu, M. Kassim, Hydrogen from photocatalytic water splitting process: A review, *Renewable and Sustainable Energy Reviews*, 43 (2015) 599-610.
- [147] V. Georgakilas, D. Gournis, V. Tzitzios, L. Pasquato, D.M. Guldi, M. Prato, Decorating carbon nanotubes with metal or semiconductor nanoparticles, *Journal of Materials Chemistry*, 17 (2007) 2679-2694.
- [148] C.K. Chua, M. Pumera, Chemical reduction of graphene oxide: a synthetic chemistry viewpoint, *Chemical Society Reviews*, 43 (2014) 291-312.
- [149] Q. Xiang, J. Yu, M. Jaroniec, Graphene-based semiconductor photocatalysts, *Chemical Society Reviews*, 41 (2012) 782-796.
- [150] J. Chen, X. Xu, T. Li, K. Pandiselvi, J. Wang, Toward High Performance 2D/2D Hybrid Photocatalyst by Electrostatic Assembly of Rationally Modified Carbon Nitride on Reduced Graphene Oxide, *Scientific Reports*, 6 (2016) 37318.
- [151] A. Singh, A.S.K. Sinha, Active CdS/rGO photocatalyst by a high temperature gas-solid reaction for hydrogen production by splitting of water, *Applied Surface Science*, 430 (2018) 184-197.
- [152] G.K. Ramesha, A. Vijaya Kumara, H.B. Muralidhara, S. Sampath, Graphene and graphene oxide as effective adsorbents toward anionic and cationic dyes, *Journal of Colloid and Interface Science*, 361 (2011) 270-277.
- [153] M.-H. Wang, Q. Li, X. Li, Y. Liu, L.-Z. Fan, Effect of oxygen-containing functional groups in epoxy/reduced graphene oxide composite coatings on corrosion protection and antimicrobial properties, *Applied Surface Science*, 448 (2018) 351-361.

- [154] Z. Tian, N. Yu, Y. Cheng, Z. Wang, Z. Chen, L. Zhang, Hydrothermal synthesis of graphene/TiO₂/CdS nanocomposites as efficient visible-light-driven photocatalysts, *Materials Letters*, 194 (2017) 172-175.
- [155] M. Wang, X. Shao, W. Li, H. Li, J. Yin, F. Liu, Hydrothermal synthesis of urchin-like reduced graphene oxide–CdS and its electrochemical property, *Journal of Alloys and Compounds*, 596 (2014) 1-4.
- [156] F. Liu, X. Shao, J. Wang, S. Yang, X. Meng, X. Liu, M. Wang, Ethylene glycol assisted hydrothermal synthesis of graphene sheets supporting CdS nanospheres for quenched photoluminescence, *Materials Science in Semiconductor Processing*, 16 (2013) 429-434.
- [157] J. Wang, S. Liu, Y. Mu, L. Liu, R. A, P. Su, J. Yang, G. Zhu, W. Fu, H. Yang, Synthesis of uniform cadmium sulphide thin film by the homogeneous precipitation method on cadmium telluride nanorods and its application in three-dimensional heterojunction flexible solar cells, *Journal of Colloid and Interface Science*, 505 (2017) 59-66.
- [158] K.-T. Yong, Y. Sahoo, M.T. Swihart, P.N. Prasad, Shape Control of CdS Nanocrystals in One-Pot Synthesis, *The Journal of Physical Chemistry C*, 111 (2007) 2447-2458.
- [159] Mart, xed, C. nez-Alonso, Rodr, #xed, guez-Casta, #xfl, C.A. eda, P. Moreno-Romero, C.S. Coria-Monroy, H. Hu, Cadmium Sulfide Nanoparticles Synthesized by Microwave Heating for Hybrid Solar Cell Applications, *International Journal of Photoenergy*, 2014 (2014) 11.
- [160] P. Kumar, D. Kukkar, A. Deep, S. Sharma, L. Bharadwaj, Synthesis of mercaptopropionic acid stabilized CDS quantum dots for bioimaging in breast cancer, 2012.

- [161] A. Viinikanoja, Z. Wang, J. Kauppila, C. Kvarnström, Electrochemical reduction of graphene oxide and its in situ spectroelectrochemical characterization, *Physical Chemistry Chemical Physics*, 14 (2012) 14003-14009.
- [162] Y. Zhang, L. Zuo, Y. Huang, L. Zhang, F. Lai, W. Fan, T. Liu, In-Situ Growth of Few-Layered MoS₂ Nanosheets on Highly Porous Carbon Aerogel as Advanced Electrocatalysts for Hydrogen Evolution Reaction, *ACS Sustainable Chemistry & Engineering*, 3 (2015) 3140-3148.
- [163] S. Pei, Q. Wei, K. Huang, H.-M. Cheng, W. Ren, Green synthesis of graphene oxide by seconds timescale water electrolytic oxidation, *Nature Communications*, 9 (2018) 145.
- [164] A. Ambrosi, C.K. Chua, A. Bonanni, M. Pumera, Electrochemistry of Graphene and Related Materials, *Chemical Reviews*, 114 (2014) 7150-7188.
- [165] P. Dey, R. Das, Ligand free surface of CdS nanoparticles enhances the energy transfer efficiency on interacting with Eosin Y dye – Helping in the sensing of very low level of chlorpyrifos in water, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, (2018).
- [166] S. Gharedaghi, S. Kimiagar, S. Safa, P-Nitrophenol Degradation Using N-Doped Reduced Graphene-CdS Nanocomposites, 2017.
- [167] N. Rajeswari Yogamalar, K. Sadhanandam, A. Chandra Bose, R. Jayavel, Quantum confined CdS inclusion in graphene oxide for improved electrical conductivity and facile charge transfer in hetero-junction solar cell, *RSC Advances*, 5 (2015) 16856-16869.
- [168] L. Ma, T. Zhang, R. Song, L. Guo, In-situ Raman study of relation between microstructure and photoactivity of CdS@TiO₂ core-shell nanostructures, *International Journal of Hydrogen Energy*, 43 (2018) 13778-13787.

- [169] N. Sahu, M.K. Arora, S.N. Upadhyay, A.S.K. Sinha, Phase Transformation and Activity of Cadmium Sulfide Photocatalysts for Hydrogen Production from Water: Role of Adsorbed Ammonia on Cadmium Sulfate Precursor, *Industrial & Engineering Chemistry Research*, 37 (1998) 4682-4688.
- [170] J. Waddell, The Conversion of Ammonium Thiocyanate into Thiourea and of Thiourea into Thiocyanate, *The Journal of Physical Chemistry*, 2 (1898) 525-535.
- [171] R. Akbarzadeh, S.S. Khalili, H. Dehghani, Fabrication and study of optical and electrochemical properties of CdS nanoparticles and the GO–CdS nanocomposite, *New Journal of Chemistry*, 40 (2016) 3528-3535.
- [172] Y. Lei, J. Xu, R. Li, F. Chen, Solvothermal synthesis of CdS–graphene composites by varying the Cd/S ratio, *Ceramics International*, 41 (2015) 3158-3161.
- [173] V. Bondarenka, Z. Martunas, S. Kaciulis, L. Pandolfi, Sol–gel synthesis and XPS characterization of sodium–vanadium oxide bronze thin films, *Journal of Electron Spectroscopy and Related Phenomena*, 131-132 (2003) 99-103.
- [174] S.K. Konda, C.K. Ostrom, A. Chen, Synthesis and electrochemical study of Cd@Pd core/shell nanomaterials for hydrogen sorption and storage, *International Journal of Hydrogen Energy*, 40 (2015) 16365-16374.
- [175] N. Jiang, Z. Xiu, Z. Xie, H. Li, G. Zhao, W. Wang, Y. Wu, X. Hao, Reduced graphene oxide–CdS nanocomposites with enhanced visible-light photoactivity synthesized using ionic-liquid precursors, *New Journal of Chemistry*, 38 (2014) 4312-4320.
- [176] J. Werner, I. Persson, O. Björneholm, D. Kawecki, C.-M. Saak, M.-M. Walz, V. Ekholm, I. Unger, C. Valtl, C. Caleman, G. Öhrwall, N.L. Prisle, Shifted equilibria of organic acids and bases in the aqueous surface region, *Physical Chemistry Chemical Physics*, 20 (2018) 23281-23293.

- [177] H. Winter, P.J. Durham, W.M. Temmerman, G.M. Stocks, Electronic density of states and the x-ray photoelectron spectra of the valence band of Cu-Pd alloys, *Physical Review B*, 33 (1986) 2370-2379.
- [178] T. Peng, K. Li, P. Zeng, Q. Zhang, X. Zhang, Enhanced Photocatalytic Hydrogen Production over Graphene Oxide–Cadmium Sulfide Nanocomposite under Visible Light Irradiation, *The Journal of Physical Chemistry C*, 116 (2012) 22720-22726.
- [179] X. Liu, P. Zeng, T. Peng, X. Zhang, K. Deng, Preparation of multiwalled carbon nanotubes/Cd_{0.8}Zn_{0.2}S nanocomposite and its photocatalytic hydrogen production under visible-light, *International Journal of Hydrogen Energy*, 37 (2012) 1375-1384.
- [180] A. Ter Heijne, O. Schaetzle, S. Gimenez, F. Fabregat-Santiago, J. Bisquert, D.P.B.T.B. Strik, F. Barrière, C.J.N. Buisman, H.V.M. Hamelers, Identifying charge and mass transfer resistances of an oxygen reducing biocathode, *Energy & Environmental Science*, 4 (2011) 5035-5043.
- [181] Z. Zhang, J.T. Yates, Band Bending in Semiconductors: Chemical and Physical Consequences at Surfaces and Interfaces, *Chemical Reviews*, 112 (2012) 5520-5551.
- [182] K.A. Svit, K.S. Zhuravlev, Scanning Tunneling Spectroscopy of Free-Standing CdS Nanocrystals Fabricated by the Langmuir–Blodgett Method, *The Journal of Physical Chemistry C*, 119 (2015) 19496-19504.
- [183] K. Scott, Process intensification: An electrochemical perspective, *Renewable and Sustainable Energy Reviews*, 81 (2018) 1406-1426.
- [184] M. Gershenson, R.M. Mikulyak, R.A. Logan, P.W. Foy, Electroluminescent recombination near the energy gap in GaP diodes, *Solid-State Electronics*, 7 (1964) 113-124.

- [185] Y.-z. Fang, X.-j. Kong, D.-t. Wang, S.-x. Cui, J.-h. Liu, Role of dopant Ga in tuning the band gap of rutile TiO₂ from first principles, *Chinese Journal of Physics*, 56 (2018) 1370-1377.
- [186] D. Ghosh, S. Kapri, S. Bhattacharyya, Phenomenal Ultraviolet Photoresponsivity and Detectivity of Graphene Dots Immobilized on Zinc Oxide Nanorods, *ACS Applied Materials & Interfaces*, 8 (2016) 35496-35504.
- [187] J. Xian, D. Li, J. Chen, X. Li, M. He, Y. Shao, L. Yu, J. Fang, TiO₂ Nanotube Array—Graphene—CdS Quantum Dots Composite Film in Z-Scheme with Enhanced Photoactivity and Photostability, *ACS Applied Materials & Interfaces*, 6 (2014) 13157-13166.
- [188] L. Qi, H. Cölfen, M. Antonietti, Synthesis and Characterization of CdS Nanoparticles Stabilized by Double-Hydrophilic Block Copolymers, *Nano Letters*, 1 (2001) 61-65.
- [189] S. Liu, Z. Luo, L. Li, H. Li, M. Chen, T. Wang, J. Gong, Multifunctional TiO₂ overlayer for p-Si/n-CdS heterojunction photocathode with improved efficiency and stability, *Nano Energy*, 53 (2018) 125-129.
- [190] Z. Wang, Z. Liu, J. Chen, H. Yang, J. Luo, J. Gao, J. Zhang, C. Yang, S. Jia, B. Liu, Self-assembly of three-dimensional CdS nanosphere/graphene networks for efficient photocatalytic hydrogen evolution, *Journal of Energy Chemistry*, (2018).
- [191] O. Quiroz-Cardoso, S. Oros-Ruiz, A. Solís-Gómez, R. López, R. Gómez, Enhanced photocatalytic hydrogen production by CdS nanofibers modified with graphene oxide and nickel nanoparticles under visible light, *Fuel*, 237 (2019) 227-235.
- [192] M. Salem, S. Akir, I. Massoudi, Y. Litaïem, M. Gaidi, K. Khirouni, Photoelectrochemical and optical properties tuning of graphene-ZnO nanocomposites, *Journal of Alloys and Compounds*, 767 (2018) 982-987.

- [193] K.K.H. De Silva, H.H. Huang, R.K. Joshi, M. Yoshimura, Chemical reduction of graphene oxide using green reductants, *Carbon*, 119 (2017) 190-199.
- [194] H. Saleem, M. Haneef, H.Y. Abbasi, Synthesis route of reduced graphene oxide via thermal reduction of chemically exfoliated graphene oxide, *Materials Chemistry and Physics*, 204 (2018) 1-7.
- [195] X. Song, Q. Shi, H. Wang, S. Liu, C. Tai, Z. Bian, Preparation of Pd-Fe/graphene catalysts by photocatalytic reduction with enhanced electrochemical oxidation-reduction properties for chlorophenols, *Applied Catalysis B: Environmental*, 203 (2017) 442-451.
- [196] T. Öznülüer, Ü. Demir, H. Öztürk Doğan, Fabrication of underpotentially deposited Cu monolayer/electrochemically reduced graphene oxide layered nanocomposites for enhanced ethanol electro-oxidation, *Applied Catalysis B: Environmental*, 235 (2018) 56-65.
- [197] G. Mathew, P. Dey, R. Das, S.D. Chowdhury, M. Paul Das, P. Veluswamy, B. Neppolian, J. Das, Direct electrochemical reduction of hematite decorated graphene oxide (α -Fe₂O₃@erGO) nanocomposite for selective detection of Parkinson's disease biomarker, *Biosensors and Bioelectronics*, 115 (2018) 53-60.
- [198] C. Chen, Z. Gan, K. Zhou, Z. Ma, Y. Liu, Y. Gao, Catalytic polymerization of N-methylthionine at electrochemically reduced graphene oxide electrodes, *Electrochimica Acta*, 283 (2018) 1649-1659.
- [199] Y.J. Oh, J.J. Yoo, Y.I. Kim, J.K. Yoon, H.N. Yoon, J.-H. Kim, S.B. Park, Oxygen functional groups and electrochemical capacitive behavior of incompletely reduced graphene oxides as a thin-film electrode of supercapacitor, *Electrochimica Acta*, 116 (2014) 118-128.

- [200] B. Gupta, N. Kumar, K. Panda, V. Kanan, S. Joshi, I. Visoly-Fisher, Role of oxygen functional groups in reduced graphene oxide for lubrication, *Scientific Reports*, 7 (2017) 45030.
- [201] D. Hou, Q. Liu, X. Wang, Y. Quan, Z. Qiao, L. Yu, S. Ding, Facile synthesis of graphene via reduction of graphene oxide by artemisinin in ethanol, *Journal of Materiomics*, 4 (2018) 256-265.
- [202] Y.-C. Lin, D.-C. Tsai, Z.-C. Chang, F.-S. Shieu, Ultrasonic chemical synthesis of CdS-reduced graphene oxide nanocomposites with an enhanced visible light photoactivity, *Applied Surface Science*, 440 (2018) 1227-1234.
- [203] H. Liu, Q. Zhao, J. Liu, X. Ma, Y. Rao, X. Shao, Z. Li, W. Wu, H. Ning, M. Wu, Synergistically enhanced activity of nitrogen-doped carbon dots/graphene composites for oxygen reduction reaction, *Applied Surface Science*, 423 (2017) 909-916.
- [204] X. Fu, Y. Zhang, P. Cao, H. Ma, P. Liu, L. He, J. Peng, J. Li, M. Zhai, Radiation synthesis of CdS/reduced graphene oxide nanocomposites for visible-light-driven photocatalytic degradation of organic contaminant, *Radiation Physics and Chemistry*, 123 (2016) 79-86.
- [205] R. Wang, S. Gao, K. Wang, M. Zhou, S. Cheng, K. Jiang, MoS₂@rGO Nanoflakes as High Performance Anode Materials in Sodium Ion Batteries, *Scientific Reports*, 7 (2017) 7963.
- [206] Z. Gao, N. Liu, D. Wu, W. Tao, F. Xu, K. Jiang, Graphene–CdS composite, synthesis and enhanced photocatalytic activity, *Applied Surface Science*, 258 (2012) 2473-2478.
- [207] M. Ben Ali, W.-K. Jo, H. Elhouichet, R. Boukherroub, Reduced graphene oxide as an efficient support for CdS-MoS₂ heterostructures for enhanced photocatalytic H₂ evolution, *International Journal of Hydrogen Energy*, 42 (2017) 16449-16458.

- [208] S.-C. Moon, H. Mametsuka, S. Tabata, E. Suzuki, Photocatalytic production of hydrogen from water using TiO₂ and B/TiO₂, *Catalysis Today*, 58 (2000) 125-132.
- [209] Y. Liu, Q. Zhu, X. Li, G. Zhang, Y. Liu, S. Tang, E. Sharman, J. Jiang, Y. Luo, Combining High Photocatalytic Activity and Stability via Subsurface Defects in TiO₂, *The Journal of Physical Chemistry C*, 122 (2018) 17221-17227.
- [210] W. Zhao, Y. Liu, Z. Wei, S. Yang, H. He, C. Sun, Fabrication of a novel p–n heterojunction photocatalyst n-BiVO₄@p-MoS₂ with core–shell structure and its excellent visible-light photocatalytic reduction and oxidation activities, *Applied Catalysis B: Environmental*, 185 (2016) 242-252.
- [211] K.D. Rasamani, F. Alimohammadi, Y. Sun, Interlayer-expanded MoS₂, *Materials Today*, 20 (2017) 83-91.
- [212] A. Basak, D. Das, D. Sen, K.K. Chattopadhyay, , *Computational Materials Science* 2014.
- [213] H. Tributsch, Layer-Type Transition Metal Dichalcogenides — a New Class of Electrodes for Electrochemical Solar Cells, *Berichte der Bunsengesellschaft für physikalische Chemie*, 81 (1977) 361-369.
- [214] T.-Y. Chen, Y.-H. Chang, C.-L. Hsu, K.-H. Wei, C.-Y. Chiang, L.-J. Li, Comparative study on MoS₂ and WS₂ for electrocatalytic water splitting, *International Journal of Hydrogen Energy*, 38 (2013) 12302-12309.
- [215] J.M. Wu, Y.-G. Sun, W.-E. Chang, J.-T. Lee, Piezoelectricity induced water splitting and formation of hydroxyl radical from active edge sites of MoS₂ nanoflowers, *Nano Energy*, 46 (2018) 372-382.
- [216] Z. Guo, W. Cui, X. Zheng, W. Liu, X. Tong, Q. Xu, Controllable solution-fabrication of triphasic 2H@1T-MoS₂/graphene heterostructure with assistance of supercritical CO₂, *Surfaces and Interfaces*, 12 (2018) 41-49.

- [217] P.-Y. Prodhomme, P. Raybaud, H. Toulhoat, Free-energy profiles along reduction pathways of MoS₂ M-edge and S-edge by dihydrogen: A first-principles study, *Journal of Catalysis*, 280 (2011) 178-195.
- [218] C. Zhu, Q. Xu, W. Liu, Y. Ren, CO₂-assisted fabrication of novel heterostructures of h-MoO₃/1T-MoS₂ for enhanced photoelectrocatalytic performance, *Applied Surface Science*, 425 (2017) 56-62.
- [219] Y. Liu, Y. Li, F. Peng, Y. Lin, S. Yang, S. Zhang, H. Wang, Y. Cao, H. Yu, 2H- and 1T- mixed phase few-layer MoS₂ as a superior to Pt co-catalyst coated on TiO₂ nanorod arrays for photocatalytic hydrogen evolution, *Applied Catalysis B: Environmental*, 241 (2019) 236-245.
- [220] M.S. Raghu, K. Yogesh Kumar, S. Rao, T. Aravinda, S.C. Sharma, M.K. Prashanth, Simple fabrication of reduced graphene oxide -few layer MoS₂ nanocomposite for enhanced electrochemical performance in supercapacitors and water purification, *Physica B: Condensed Matter*, 537 (2018) 336-345.
- [221] E. Benavente, F. Durán, C. Sotomayor-Torres, G. González, Heterostructured layered hybrid ZnO/MoS₂ nanosheets with enhanced visible light photocatalytic activity, *Journal of Physics and Chemistry of Solids*, 113 (2018) 119-124.
- [222] X. Yu, J. Shi, L. Wang, W. Wang, J. Bian, L. Feng, C. Li, A novel Au NPs-loaded MoS₂/RGO composite for efficient hydrogen evolution under visible light, *Materials Letters*, 182 (2016) 125-128.
- [223] Y. You, Y. Ye, M. Wei, W. Sun, Q. Tang, J. Zhang, X. Chen, H. Li, J. Xu, Three-dimensional MoS₂/rGO foams as efficient sulfur hosts for high-performance lithium-sulfur batteries, *Chemical Engineering Journal*, 355 (2019) 671-678.

- [224] K. Chang, Z. Mei, T. Wang, Q. Kang, S. Ouyang, J. Ye, MoS₂/Graphene Cocatalyst for Efficient Photocatalytic H₂ Evolution under Visible Light Irradiation, *ACS Nano*, 8 (2014) 7078-7087.
- [225] J.M. Woods, Y. Jung, Y. Xie, W. Liu, Y. Liu, H. Wang, J.J. Cha, One-Step Synthesis of MoS₂/WS₂ Layered Heterostructures and Catalytic Activity of Defective Transition Metal Dichalcogenide Films, *ACS Nano*, 10 (2016) 2004-2009.
- [226] J. Zhao, Z. Zhang, S. Yang, H. Zheng, Y. Li, , *Journal of Alloys and Compounds*, 559 (2013) 87-91.
- [227] A.B. Yousaf, M. Imran, M. Farooq, P. Kasak, Synergistic effect of Co–Ni co-bridging with MoS₂ nanosheets for enhanced electrocatalytic hydrogen evolution reactions, *RSC Advances*, 8 (2018) 3374-3380.
- [228] X.-Y. Yu, Y. Feng, Y. Jeon, B. Guan, X. Wen Lou, U. Paik, Formation of Ni–Co–MoS₂ Nanoboxes with Enhanced Electrocatalytic Activity for Hydrogen Evolution, 2016.
- [229] X. Zhu, P. Wang, Q. Zhang, Z. Wang, Y. Liu, X. Qin, X. Zhang, Y. Dai, B. Huang, CdS–MoS₂ heterostructures on Mo substrates via in situ sulfurization for efficient photoelectrochemical hydrogen generation, *RSC Advances*, 7 (2017) 44626-44631.
- [230] B. Han, S. Liu, N. Zhang, Y.-J. Xu, Z.-R. Tang, One-dimensional CdS@MoS₂ core-shell nanowires for boosted photocatalytic hydrogen evolution under visible light, *Applied Catalysis B: Environmental*, 202 (2017) 298-304.
- [231] T. Zhang, H. Zhang, Y. Ji, N. Chi, Y. Cong, Preparation of a novel Fe₂O₃-MoS₂-CdS ternary composite film and its photoelectrocatalytic performance, *Electrochimica Acta*, 285 (2018) 230-240.

- [232] S. Li, T. Pu, J. Wang, X. Fang, Y. Liu, S. Kang, L. Cui, Efficient visible-light-driven hydrogen evolution over ternary MoS₂/PtTiO₂ photocatalysts with low overpotential, *International Journal of Hydrogen Energy*, 43 (2018) 16534-16542.
- [233] Z. Kan, W. Kim, M. Ma, X. Shi, J.H. Park, Tuning the charge transfer route by p–n junction catalysts embedded with CdS nanorods for simultaneous efficient hydrogen and oxygen evolution, 2015.
- [234] W.-c. Peng, Y. Chen, X.-y. Li, MoS₂/reduced graphene oxide hybrid with CdS nanoparticles as a visible light-driven photocatalyst for the reduction of 4-nitrophenol, *Journal of Hazardous Materials*, 309 (2016) 173-179.
- [235] Y. Li, H. Wang, S. Peng, Tunable Photodeposition of MoS₂ onto a Composite of Reduced Graphene Oxide and CdS for Synergic Photocatalytic Hydrogen Generation, *The Journal of Physical Chemistry C*, 118 (2014) 19842-19848.
- [236] G. Hummer, J.C. Rasaiah, J.P. Noworyta, Water conduction through the hydrophobic channel of a carbon nanotube, *Nature*, 414 (2001) 188.
- [237] T. Weber, J.C. Muijsers, J.H.M.C. van Wolput, C.P.J. Verhagen, J.W. Niemantsverdriet, Basic Reaction Steps in the Sulfidation of Crystalline MoO₃ to MoS₂, As Studied by X-ray Photoelectron and Infrared Emission Spectroscopy, *The Journal of Physical Chemistry*, 100 (1996) 14144-14150.
- [238] F. Li, X. Jiang, J. Zhao, S. Zhang, Graphene oxide: A promising nanomaterial for energy and environmental applications, *Nano Energy*, 16 (2015) 488-515.
- [239] G. Berhault, L. Cota, J.a. Duarte-Moller, A. Mehta, R. Chianelli, Modifications of Unpromoted and Cobalt-Promoted MoS₂ During Thermal Treatment by Dimethylsulfide, 2002.
- [240] T.N.Y. Khawula, K. Raju, P.J. Franklyn, I. Sigalas, K.I. Ozoemena, Symmetric pseudocapacitors based on molybdenum disulfide (MoS₂)-modified carbon

nanospheres: correlating physicochemistry and synergistic interaction on energy storage, *Journal of Materials Chemistry A*, 4 (2016) 6411-6425.

[241] M.H. Habibi, M.H. Rahmati, Fabrication and characterization of ZnO@CdS core-shell nanostructure using acetate precursors: XRD, FESEM, DRS, FTIR studies and effects of cadmium ion concentration on band gap, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 133 (2014) 13-18.

[242] C. Hampton, D. Demoin, R.E. Glaser, VIBRATIONAL SPECTROSCOPY TUTORIAL: SULFUR AND PHOSPHORUS.

[243] G.B. Ferreira, N.M. Comerlato, J.L. Wardell, E. Hollauer, Vibrational spectra of bis(dmit) complexes of main group metals: IR, Raman and ab initio calculations, *Journal of the Brazilian Chemical Society*, 15 (2004) 951-963.

[244] J. Curry, Chemical applications of infrared spectroscopy Rao, C. N. R.), *Journal of Chemical Education*, 42 (1965) 117.

[245] X. Li, H. Zhu, Two-dimensional MoS₂: Properties, preparation, and applications, 2015.

[246] R. Wang, S. Wang, D. Jin, Y. Zhang, Y. Cai, J. Ma, L. Zhang, Engineering layer structure of MoS₂-graphene composites with robust and fast lithium storage for high-performance Li-ion capacitors, *Energy Storage Materials*, 9 (2017) 195-205.

[247] Z.-Y. Zhao, Q.-L. Liu, Study of the layer-dependent properties of MoS₂ nanosheets with different crystal structures by DFT calculations, *Catalysis Science & Technology*, 8 (2018) 1867-1879.

[248] P.P.A. Jose, M.S. Kala, N. Kalarikkal, S. Thomas, Reduced graphene oxide produced by chemical and hydrothermal methods, *Materials Today: Proceedings*, 5 (2018) 16306-16312.

- [249] Y. Ma, Y. Liu, Y. Bian, A. Zhu, Y. Yang, J. Pan, Controlling shape anisotropy of hexagonal CdS for highly stable and efficient photocatalytic H₂ evolution and photoelectrochemical water splitting, *Journal of Colloid and Interface Science*, 518 (2018) 140-148.
- [250] Q. Wang, J. Lian, J. Li, R. Wang, H. Huang, B. Su, Z. Lei, Highly Efficient Photocatalytic Hydrogen Production of Flower-like Cadmium Sulfide Decorated by Histidine, *Scientific Reports*, 5 (2015) 13593.
- [251] Z. Luo, Y. Ouyang, H. Zhang, M. Xiao, J. Ge, Z. Jiang, J. Wang, D. Tang, X. Cao, C. Liu, W. Xing, Chemically activating MoS₂ via spontaneous atomic palladium interfacial doping towards efficient hydrogen evolution, *Nature Communications*, 9 (2018) 2120.
- [252] E. Ha, W. Liu, L. Wang, H.-W. Man, L. Hu, S.C.E. Tsang, C.T.-L. Chan, W.-M. Kwok, L.Y.S. Lee, K.-Y. Wong, Cu₂ZnSnS₄/MoS₂-Reduced Graphene Oxide Heterostructure: Nanoscale Interfacial Contact and Enhanced Photocatalytic Hydrogen Generation, *Scientific Reports*, 7 (2017) 39411.
- [253] T.S. Sahu, S. Mitra, Exfoliated MoS₂ Sheets and Reduced Graphene Oxide-An Excellent and Fast Anode for Sodium-ion Battery, *Scientific Reports*, 5 (2015) 12571.
- [254] X. Zheng, J. Xu, K. Yan, H. Wang, Z. Wang, S. Yang, Space-Confined Growth of MoS₂ Nanosheets within Graphite: The Layered Hybrid of MoS₂ and Graphene as an Active Catalyst for Hydrogen Evolution Reaction, *Chemistry of Materials*, 26 (2014) 2344-2353.
- [255] E. Akbarzadeh, S. Rahman Setayesh, M.R. Gholami, Investigating the role of MoS₂/reduced graphene oxide as cocatalyst on Cu₂O activity in catalytic and photocatalytic reactions, *New Journal of Chemistry*, 41 (2017) 7998-8005.

- [256] S. Kumar, N. Lakshmana Reddy, H. Kushwaha, A. Kumar, S. Muthukonda Venkatakrishnan, K. Bhattacharyya, A. Halder, V. Krishnan, Efficient Electron Transfer across a ZnO–MoS₂–Reduced Graphene Oxide Heterojunction for Enhanced Sunlight-Driven Photocatalytic Hydrogen Evolution, 2017.
- [257] S. Kumar, V. Sharma, K. Bhattacharyya, V. Krishnan, Synergetic effect of MoS₂–RGO doping to enhance the photocatalytic performance of ZnO nanoparticles, *New Journal of Chemistry*, 40 (2016) 5185-5197.
- [258] X. Hu, F. Deng, W. Huang, G. Zeng, X. Luo, D.D. Dionysiou, The band structure control of visible-light-driven rGO/ZnS–MoS₂ for excellent photocatalytic degradation performance and long-term stability, *Chemical Engineering Journal*, 350 (2018) 248-256.
- [259] W. Jian, X. Cheng, Y. Huang, Y. You, R. Zhou, T. Sun, J. Xu, Arrays of ZnO/MoS₂ nanocables and MoS₂ nanotubes with phase engineering for bifunctional photoelectrochemical and electrochemical water splitting, *Chemical Engineering Journal*, 328 (2017) 474-483.
- [260] A.M. Douvas, M. Vasilopoulou, D.G. Georgiadou, A. Soutlati, D. Davazoglou, N. Vourdas, K.P. Giannakopoulos, A.G. Kontos, S. Kennou, P. Argitis, Sol–gel synthesized, low-temperature processed, reduced molybdenum peroxides for organic optoelectronics applications, *Journal of Materials Chemistry C*, 2 (2014) 6290-6300.
- [261] L. Zhao, J. Jia, Z. Yang, J. Yu, A. Wang, Y. Sang, W. Zhou, H. Liu, One-step synthesis of CdS nanoparticles/MoS₂ nanosheets heterostructure on porous molybdenum sheet for enhanced photocatalytic H₂ evolution, 2017.
- [262] M.A. Bissett, I.A. Kinloch, R.A.W. Dryfe, Characterization of MoS₂–Graphene Composites for High-Performance Coin Cell Supercapacitors, *ACS Applied Materials & Interfaces*, 7 (2015) 17388-17398.

- [263] M. Ding, N. Yao, C. Wang, J. Huang, M. Shao, S. Zhang, P. Li, X. Deng, X. Xu, ZnO@CdS Core-Shell Heterostructures: Fabrication, Enhanced Photocatalytic, and Photoelectrochemical Performance, *Nanoscale Research Letters*, 11 (2016) 205.
- [264] S.J. Kerber, J.J. Bruckner, K. Wozniak, S. Seal, S. Hardcastle, T.L. Barr, The nature of hydrogen in x-ray photoelectron spectroscopy: General patterns from hydroxides to hydrogen bonding, *Journal of Vacuum Science & Technology A*, 14 (1996) 1314-1320.
- [265] A.V. Agrawal, N. Kumar, S. Venkatesan, A. Zakhidov, C. Manspecker, Z. Zhu, F.C. Robles Hernandez, J. Bao, M. Kumar, Controlled Growth of MoS₂ Flakes from in-Plane to Edge-Enriched 3D Network and Their Surface-Energy Studies, *ACS Applied Nano Materials*, 1 (2018) 2356-2367.
- [266] X. Tang, Z. Wang, W. Huang, Q. Jing, N. Liu, Construction of N-doped TiO₂/MoS₂ heterojunction with synergistic effect for enhanced visible photodegradation activity, *Materials Research Bulletin*, 105 (2018) 126-132.
- [267] Y. Peng, R. Ding, Q. Ren, S. Xu, L. Sun, Y. Wang, F. Lu, High performance photodiode based on MoS₂/pentacene heterojunction, *Applied Surface Science*, 459 (2018) 179-184.
- [268] X. Chen, J. Zhang, J. Zeng, Y. Shi, S. Lin, G. Huang, H. Wang, Z. Kong, J. Xi, Z. Ji, MnS coupled with ultrathin MoS₂ nanolayers as heterojunction photocatalyst for high photocatalytic and photoelectrochemical activities, *Journal of Alloys and Compounds*, 771 (2019) 364-372.
- [269] M. Acerce, D. Voiry, M. Chhowalla, Metallic 1T phase MoS₂ nanosheets as supercapacitor electrode materials, *Nature Nanotechnology*, 10 (2015) 313.

- [270] X. Guo, G. Yang, J. Zhang, X. Xu, Structural, mechanical and electronic properties of in-plane 1T/2H phase interface of MoS₂ heterostructures, *AIP Advances*, 5 (2015) 097174.
- [271] M. Grossi, B. Riccò, Electrical impedance spectroscopy (EIS) for biological analysis and food characterization: a review, *Journal of Sensors and Sensor Systems*, 6 (2016) 303-325.
- [272] P.K.P. Ferraz, R. Schmidt, D. Kober, J. Kowal, A high frequency model for predicting the behavior of lithium-ion batteries connected to fast switching power electronics, *Journal of Energy Storage*, 18 (2018) 40-49.
- [273] A. Adán-Más, T.M. Silva, L. Guerlou-Demourgues, M.F.G. Montemor, Application of the Mott-Schottky model to select potentials for EIS studies on electrodes for electrochemical charge storage, *Electrochimica Acta*, (2018).
- [274] Z. Xu, H. Wang, Y. Wen, W. Li, C. Sun, Y. He, Z. Shi, L. Pei, Y. Chen, S. Yan, Balancing Catalytic Activity and Interface Energetics of Electrocatalyst-Coated Photoanodes for Photoelectrochemical Water Splitting, *ACS applied materials & interfaces*, 10 (2018) 3624-3633.