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Metal and Metal Oxides for Energy and Electronics

Springer

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Preface

> If you want to find the secrets of the universe, think in terms of energy, frequency and vibration. Nikola Tesla

Energy is a major challenge for humans in the context of climate change and increasing population. In particular, global warming is partly due to CO_2 emissions from the excessive use of fossil fuels such as oil, coal and gas. Research has thus recently focused on sustainable biofuels and energy storage. In particular, nanomaterials and metal oxides are enhancing the efficiency of batteries, supercapacitors, fuel cells and electronics. For instance, optoelectronic devices consume much less power than classical devices. Materials for rechargeable batteries are presented in Chap. 1 by Balaji Sambandam et al., with emphasis on electrochemical properties of metal oxide-based electrode materials for energy storage. In Chap. 2, Akhila Das et al. review molybdenum disulphide supercapacitors and high performance electrodes. Chapter 3 by Ryan D. Corpuz et al. highlights the development of manganese oxide as cathode material in rechargeable zinc ion batteries (Figure). Shanmuga Sundar et al. review conductive oxides in the fabrication and application of flexible electronic devices in Chap. 4. Chapter 5 by Ramarajan et al. summarizes major findings on SnO_2 doped with Sb and Sb-Ba, Nb and Ta using spray pyrolysis.

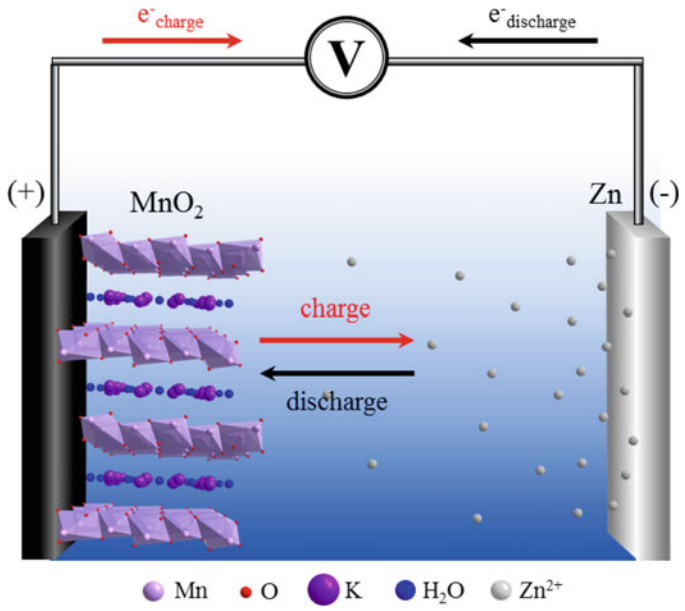

Figure. MnO_2-based zinc ion battery, from Chap. 3. A typical MnO_2-zinc ion battery consists of a Zn anode and MnO_2 cathode. A layered or tunnel structure MnO_2 as cathode is used together with an aqueous electrolyte such as $ZnSO_4$ solution

Advances in optical communication are discussed in Chap. 6 by Samuel Paul David et al., who review metal oxide semiconductors and optoelectronic applications such as light emitting diodes, solar cells, photodetectors, gas sensors and heat mirrors. Energy applications of zinc oxide in biomedicine, energy conversion and electrochemical sensing are presented by Barbosa et al. in Chap. 7. Chapter 8 by Dutta reviews metal oxides and sulfides-based gas sensors. In Chap. 9, Chintagunta et al. explain the role of metallic nanomaterials for algal biofuel production. Chapter 10 by Khan et al. discusses the fabrication of humidity sensors based on nanostructured Al_2O_3 using the thin-film sol-gel method. Muneeswaran et al. present in Chap. 11 the multiferroic properties of rare earth doped $BiFeO_3$ and their spintronic applications.

The main credit for this book goes to the contributing authors. We thank them very much for their high quality chapters.

Arica, Chile — Saravanan Rajendran

Bangkok, Thailand — Jiaqian Qin

Santiago, Chile — Francisco Gracia

Aix-en-Provence, France — Eric Lichtfouse

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Saravanan Rajendran received his PhD in Physics – Material Science in 2013 from the Department of Nuclear Physics, University of Madras, and Chennai, India. He was awarded the University Research Fellowship (URF) during the years 2009–2011 by the University of Madras. After working as an Assistant Professor at Dhanalakshmi College of Engineering, Chennai, India, from 2013 to 2014, he was awarded SERC and CONICYT-FONDECYT postdoctoral fellowship by the University of Chile, Santiago, Chile, in 2014–2017. He has worked (2017–2018) in the research group of Professor John Irvine, School of Chemistry, University of St Andrews, UK, as a Postdoctoral Research Fellow within the framework of a EPSRC-Global Challenges Research Fund for the removal of Blue-Green Algae and their toxins. Currently, he is currently working as a Research Scientist in the Faculty of Engineering, Department of Mechanical Engineering, University of Tarapacá, Arica, Chile, and also as Research Associate in SERC, University of Chile, Santiago, Chile. He is Associate Editor of *International Journal of Environmental Science and Technology* (Springer). His research interests focus in the area of nanostructured functional materials, photophysics, surface chemistry and nanocatalysts for renewable energy and waste water purification. He has published in 60+ (5600+ citation and h index 30) international peer-reviewed journals and 13+ book chapters and edited 8 books for renowned international publishers.

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