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Editorial

Hydrogen storage in solids: Materials, systems and application trends: A preface to the special section on “E-MRS 2015 Fall Meeting Symposium C, 15–18 September 2015, Warsaw, Poland”



Supporting the prospect of a viable hydrogen economy, intensive efforts continue to be devoted worldwide to the research and development of materials with suitable hydrogen storage properties. Enormous progress has been accomplished over the last decade that has led to high impact scientific and technological achievements and an impressive breadth of materials, spanning from traditional metal hydrides to complex and chemical hydrides, and from carbon structures to metal organic frameworks, and nanoconfined composite materials. The rapid progress in materials science has opened groundbreaking directions and has guided the tailoring of materials' microstructures from bulk crystalline to amorphous state and nanostructures, while advanced characterization and simulation methods have contributed to the elucidation of key mechanisms, the in-silico assessment/design of materials and the optimization of hydrogen storage systems. In addition, the accumulated knowledge has greatly inspired and promoted research in other leading edge energy storage technologies such as secondary Ni-MH and Li-ion batteries.

International collaborative research on solid-state hydrogen storage has played a decisive role in the current state-of-the art in the field. One of the largest networks that aimed to push the limits in solid-state hydrogen storage, has been the COST Action MP1103 “Nanostructured Materials for Solid State Hydrogen Storage” (<http://www.cost-mp1103.eu>); this was supported by the European Cooperation in Science and Technology, Europe's longest-running intergovernmental framework focusing on the coordination of nationally-funded research on a European level. COST Action MP1103 ran for 4 years (2011–2015) and brought together a remarkably large number of leading groups (more than 250 researchers) in the hydrogen storage community from not only across but also outside Europe. During the lifetime of the Action, strong collaborations emerged leading to high quality, novel work that has clearly contributed to the development and better understanding of hydrogen storage materials.

In order to set a forum to discuss these accomplishments but also attract renowned scientists from different sectors of the quite active international hydrogen and electrochemical community, COST Action MP1103 organised Symposium C on “Hydrogen storage in solids: materials, systems and application trends”, within the framework of the E-MRS2015 Fall Meeting that took place in Warsaw-Poland between 15 and 18 September 2015.

The Symposium focused mainly on the latest advances in the area of hydrogen storage materials (metallic – complex – chemical hydrides, nanoporous sorbents, nanocomposites, thin films) as well as on the fundamentals of the pertinent hydrogen storage processes, placing emphasis on a wide range of critical aspects (advanced characterization, thermodynamics and reaction kinetics, catalytic properties, reaction mechanisms, diffusion and transport phenomena, modeling approaches for the description of materials and processes at different scales). At the same time, traditional and emerging applications were also highlighted by showcasing significant results among others in hydrogen and thermal storage systems, batteries and fuel cell components, as well as metal hydride compressors.

This Special Section comprises a collection from selected contributions to the E-MRS 2015 Fall Meeting Symposium C including an extensive Review article that summarizes the diverse achievements of COST Action MP1103, reflecting to a significant degree the current state-of-the art in the solid-state hydrogen storage.

All manuscripts were selected through the standard peer review process of IJHE. We would like to thank all authors and the referees for their efforts and high quality contributions, as well as the Founding Editor-in Chief of the International Journal of Hydrogen Energy, Prof. T. Nejat Veziroglou who kindly accepted to publish this Special Section. We owe special thanks to the Associate Editor Prof. Caglan Kumbur as well as to Amy Mutale and Wendy Ye (IJHE Journal Managers) for their steady, swift and kind support throughout the manuscripts' handling process.

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