Journal of Nanomaterials

Special Issue on

Hydrogen Storage Materials: From Fundamental Science towards Applications

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The use of fossil fuels as an energy supply becomes increasingly problematic from the point of view of both environmental emissions and energy sustainability. As an alternative, hydrogen is widely regarded as a key element for a potential energy solution. However, differently from fossil fuels such as oil, gas, and coal, hydrogen is a secondary energy source, which means that its production also requires energy. The possibility to produce hydrogen utilizing different intermittent renewable resources such as solar energy and wind energy presents multiple advantages. On the one hand, it will contribute to a remarkable reduction of pollutants released to the air, and on the other hand it will significantly enhance the security of energy supply. In addition, the implementation of the hydrogen as "energy carrier" will result in effective and synergic utilization of the renewable energy resources. In this respect, hydrogen storage technology is considered a key roadblock towards the use of H_2 as an energy carrier. Among the methods available to store hydrogen, solid-state storage appears to be the most attractive alternative from both the safety and the volumetric energy density points of view. Recently, because of their appealing hydrogen storage properties, metal hydrides, complex hydrides, complex hydride mixtures, multicomponent hydride systems, and high surface area materials (e.g., metal oxide frameworks (MOFs), activated carbon (AC), carbon nanotubes (CNT), etc.) attracted considerable attention as potential hydrogen storage materials for technological applications.

The purpose of this special issue is to publish original high-quality research papers as well as review articles addressed to enhance the development in the hydrogen storage area. The themes covered in this issue include various aspects from basic aspects of the hydrogen storage materials (synthesis and hydride material characterization, kinetics, and thermodynamics behavior) to technological implementation vision (scaling-up, tank modeling).

Potential topics include, but are not limited to:

- Hydrogen storage in single and multicomponent systems
- Reaction mechanisms/pathways in complex systems
- Hydrogen storage in nanoconfined systems
- Scaled-up systems
- Hydrides in energy storage applications
- Technological development/challenges in solid-state hydrogen storage

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