Electrochemical Interfaces for Energy Conversion and Storage

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Abstract

Technologies for electrochemical energy conversion, storage and hydrogen production, such as fuel cells, batteries and electrolyzers have evolved as a prevailing option in achieving environmentally neutral energy and transportation sectors. Global deployment of these technologies dictates perpetual demand for improved functionality and performance of employed materials that are mainly based on scarce elements. Research aimed towards the design and synthesis of materials with advanced electrochemical properties, while diminishing the need for rare constituents, will be presented. Emphasis will be placed on the fundamental understanding of well-defined electrified interfaces and resolving their functionality at atomic and molecular scale. The role of structure, spatial arrangement and nature of the surface atoms will be discussed for different reactive species, spectators, and impurities. These multidisciplinary efforts rely on a variety of experimental and theoretical tools, including surface specific ultra-high vacuum characterization, physical and chemical vapor deposition, chemical synthesis, electron microscopy, computational studies and synchrotron techniques.