Physics of Energy Storage Materials

APS 2011 March Meeting Focus-Topic – March 21-25, 2011 Dallas, Texas

Co-sponsored by the Division of Materials Physics (DMP), Group on Energy Research and Applications (GERA), Division of Computational Physics, and the Forum on Industrial and Applied Physics (FIAP)

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Energy storage is a cross-cutting topic that impacts applications ranging from transportation and portable electronics to large-scale (grid-based) storage for intermittent, renewable power sources. As the properties of energy storage devices depend critically upon the active materials from which they are constituted, improvements in capacity and power density hinge upon achieving a comprehensive understanding of the underlying materials physics and chemistry. Towards this goal, this Focus Topic will broadly cover the physics of energy storage materials. Specific topics of interest include, but are not limited to: advanced lithium-ion and metal-air batteries; hydrogen storage; supercapacitors; catalytic phenomena in energy storage; nanostructured materials; intercalation and insertion compounds; ionic and electronic conductive polymers; novel synthesis methods; recent advances in real-time or in situ characterization techniques; and computational approaches ranging from ab initio calculations to mesoscale and continuum modeling. Of particular interest are studies which elucidate performance-limiting phenomena or which describe novel compounds or synthetic approaches aimed at overcoming these limitations.