Towards an Environmentally Benign Rechargeable Battery System through Compound Ferrite Nanoparticles

Rechargeable batteries are essential components of any sustainable energy systems, including solar cells and wind turbines to mitigate the intermittency of natural phenomenon. With rapid global warming it is increasingly becoming essential for rechargeable batteries to connect to the electric grid systems. While lithium ion batteries have powered the technology of small scale electronics and some large scale technologies like hybrid vehicles, their progression to larger grid scale energy application is hampered mostly by the scarcity of lithium and the rare earth metals these batteries are based on.

Sodium is the second lightest alkali next to lithium, the electron affinity of sodium is almost identical to lithium, and sodium is virtually unlimited in the earth's crust and oceans. Leveraging on the large repertoire of knowledge on lithium ion batteries we seek a shift of paradigm in rechargeable battery technology through a combination of Density Functional Theory (DFT) driven design and chemical synthesis of environmentally benign compound ferrite nanomaterials, fabrication of Sodium ion batteries based on ferrite nanomaterial thin film anodes, electrochemical characterization and performance analysis of the fabricated sodium ion batteries.

I will talk about our work on the synthesis of environmentally benign compound ferrite $M_nFe_{3-n}O_4$ (M = Fe, Al, Sn, Mn, and Cu) nanoparticle systems, the advantages and challenges of the application of nanoparticles in rechargeable batteries, lithium ion batteries with cobalt oxide nanoparticles and some preliminary results from our recent work on sodium ion batteries.

Department of Physics
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Theoretical and Applied Physics

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Davis Center

Frank Livak Room 417

Refreshments will be available at 3:30 PM.

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