

Chemistry and Energetics of Iron Pyrite (FeS_2) Surfaces

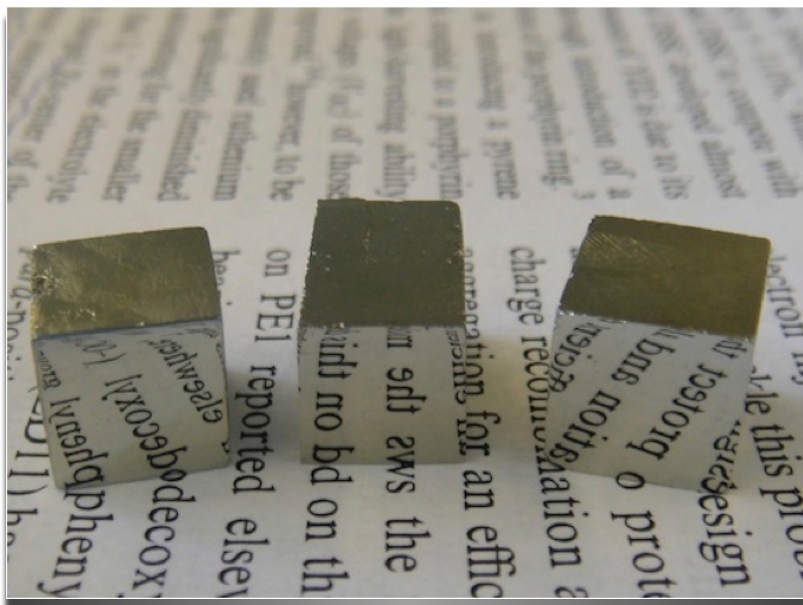
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The realization of cost-competitive solar-to-electrical energy conversion will have a transformative impact on a wide range of important issues ranging from the environment to national security. FeS_2 has great potential, but it is currently not a realistic component of cost-efficient solar energy conversion devices.

FeS_2 was in use over 100 years ago as a crucial component in crystal radios but is currently only used for this purpose by antique-radio hobbyists and for educational purposes. It showed great promise as a solar energy conversion material when near-unity photon-to-electron conversion efficiency was demonstrated in 1986 using synthetic single crystal FeS_2 /liquid junctions. However, the low (approximately 200 mV) open-circuit potential (V_{oc}) limited performance and was ascribed to deleterious surface states. It is now thought that Fermi-level pinning and other performance limitations can arise from bulk and interfacial defects.

This presentation will describe the history of the field up to the current state of the art, what challenges are facing researchers trying to realize pyrite as a solar-energy conversion material, what the Johansson lab is doing specifically, and the potential impact of our work.



Erik Johansson was born in the middle of Sweden (approximately the same latitude as Mount McKinley, Alaska). He is a third generation chemist who completed his undergraduate studies at KTH, the Royal Institute of Technology, in Stockholm, Sweden. He completed his dissertation on electron transfer processes in sol-gel materials under the supervision of Professor Jeffrey Zink at UCLA, and continued postdoctoral research in semiconductor electrochemistry and surface properties with Professor Nathan Lewis at CalTech. As an independent researcher at Portland State

University, he is continuing studies related to renewable energy technologies with an emphasis on surface phenomena. He is also the manager of the PGE Foundation Renewable Energy Research Laboratory. <http://johansson.chem.pdx.edu/doku.php>

Saturday, March 8, 2014, Le Café Stella, Santa Barbara., 12:00 PM
www.lospadresacs.org