

Show Abstract**4:15 PM - PP8.07**Phase Determination of Crystalline Al₂O₃ Deposited on Si Nanowires by Atomic Layer DepositionMichael B. Katzi, Mark E. Twigg¹, Sharka M. Prokes¹.¹, US Naval Research Laboratory, Washington, District of Columbia, United States.**Show Abstract****4:30 PM - PP8.08**

Evaluation of Electrolytes for Si-Based Negative Electrodes

Li Yang¹, Mei Cai¹, Peng Lu¹, Fang Dai¹, Meng Jiang¹, Qiangfeng Xiao¹, Mark Verbrugge¹, Marty Ruthkosky¹.¹, GM, Warren, Michigan, United States.**Show Abstract****PP9: Poster Session III**

- Wednesday PM, December 2, 2015
- Hynes, Level 1, Hall B

8:00 PM - PP9.01

Graphene and Mesoporous Silicon Composite Nanoarchitectures as Stable, High-Performance Li-Ion Batteries Anodes

Sanju Gupta¹, Jared Walden¹.¹, Western Kentucky University, Bowling Green, Kentucky, United States.**Show Abstract****8:00 PM - PP9.02**

Thermodynamic and Kinetic Consideration on the Conversion-Type Lithium Storage in Vanadium Oxides

Jeong Beom Lee¹, Janghyuk Moon², Jae Gil Lee¹, Hong Seo Hwang¹, Oh B Chae¹, Ji Heon Ryu³, Maenghyo Cho², Kyeongjae Cho², Seung M. Oh¹.

¹, Department of Chemical and Biological Engineering, Seoul National University, Seoul, Korea (the Republic of); ², WCU Multiscale Mechanical Design Division, Department of Mechanical and Aerospace Engineering, Seoul National University, Seoul, Korea (the Republic of); ³, Graduate School of Knowledge-based Technology and Energy, Korea Polytechnic University, Gyeonggi, Korea (the Republic of); ⁴, Department of Materials Science and Engineering and Department of Physics, The University of Texas at Dallas, Richardson, Texas, United States.

Show Abstract**8:00 PM - PP9.03**Structure, Ion Dynamics, and Stability of Cubic Li₇La₃Zr_{2-x}Mo⁶⁺_xO₁₂ GarnetsDaniel Rettenwander³, Andreas Welzl⁴, Patrick Bottke¹, Walter Schmidt¹, Lei Cheng², Guenther Redhammer³, Maurizio Musso³, Marca M. Doeffl², Georg Amthauer³, Martin Wilkening¹, Juergen Fleig⁴.

¹, Christian Doppler Laboratory for Lithium Batteries, and Institute for Chemistry and Technology of Materials, Graz University of Technology, Graz, Austria; ², Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, Berkeley, California, United States; ³, Department of Materials Science and Engineering, University of Berkeley, Berkeley, California, United States; ⁴, Institute for Chemical Technologies and Analytics, Vienna University of Technology, Vienna, Austria.

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Cubic Li₇La₃Zr₂O₁₂ (LLZO) garnet (1a-3d) and its variants¹ show high Li-ion conductivity, ($\sigma_{\text{bulk}} \approx 10^{-3}$ - 10^{-4} S cm⁻¹ at room temperature (RT)) and superior chemical and electrochemical stabilities. In particular, the stability against Li-metal makes LLZO exceptionally well suited to be used as protecting layer in Li-metal based battery concepts. Unfortunately, the tetragonal polymorph of LLZO is more stable at RT than the cubic phase. Therefore, supervalent dopants are needed to stabilize the cubic phase at RT. In this study we were able to stabilize cubic LLZO via substitution of Zr⁴⁺ by Mo⁶⁺. With a Mo⁶⁺ content of 0.25 pfu the cubic LLZO phase is overall stabilized in the synthesis. The solubility limit of Mo⁶⁺ is about 0.3 pfu. Based on neutron powder diffraction and Raman spectroscopy Mo⁶⁺ is located at the 16a site of LLZO. Since Mo⁶⁺ has a smaller ionic radius compared to Zr⁴⁺ the lattice parameter, a₀, decreases as a function of the Mo⁶⁺ content (12.970 to 12.955 Å). The highest σ_{bulk} is about $\sim 10^{-3}$ S cm⁻¹ but varies significantly for nominally identical samples, i.e. within samples identically prepared/stored. The voltage stability window of Mo⁶⁺ doped LLZO was checked by using cyclic-voltammetry measurements indicating that the material is stable up to 6 V. In addition, Mo-doped LLZO was used as a model system to investigate the elementary steps of Li-ion diffusion within the cubic garnet lattice by using various ⁷Li NMR techniques. For instance, NMR relaxometry points to a less pronounced distribution of Li jump in the Li-ion sublattice than it was observed for the Al-stabilized LLZO. Since Al occupies the 24d and 96h sites this feature can most probably be related to the Li-ion sublattice that remains intact by using Mo⁶⁺ for stabilization of the cubic phase.

[1] Murugan, R.; Thangadurai, V. Weppner, W. Fast Lithium Ion Conduction in Garnet-type Li₇La₃Zr₂O₁₂; Angew. Chem. Int. Ed. 2007, 46, 7778.**8:00 PM - PP9.04**Microwave-Assisted Solvothermal Synthesis of High-Performance LiCoPO₄ Using Various SolventsJennifer Ludwig¹, Carlos Eduardo Alarcon Suesca¹, Cyril Marino², Dominik Haering², Christoph Stinner⁴, Hubert A. Gasteiger², Tom Nilges¹.

¹, Department of Chemistry, Synthesis and Characterization of Innovative Materials, Technische Universität München, Garching, Germany; ², Department of Chemistry, Technical Electrochemistry, Technische Universität München, Garching, Germany; ³, Electrochemical Energy Storage, Paul Scherrer Institute, Villigen, Switzerland; ⁴, BMW AG, Munich, Germany.

Show Abstract**8:00 PM - PP9.05**

The Impact of Compositionally Induced Residual Stress on Electrochemical Shock in Battery Electrode Particles

Hakan Tanriover¹, Brian W. Sheldon¹.¹, Brown University, Providence, Rhode Island, United States.**Show Abstract****8:00 PM - PP9.06**Stabilizing Three-Dimensionally Ordered Mesoporous Carbon for Li-O₂ Battery ApplicationsIan P. Madden¹, Xiahui Yao¹, Qingmei Cheng¹, Jin Xie¹, Dunwei Wang¹.¹, Chemistry Department, Boston College, Chestnut Hill, Massachusetts, United States.