TcSUH SPECIAL SEMINAR

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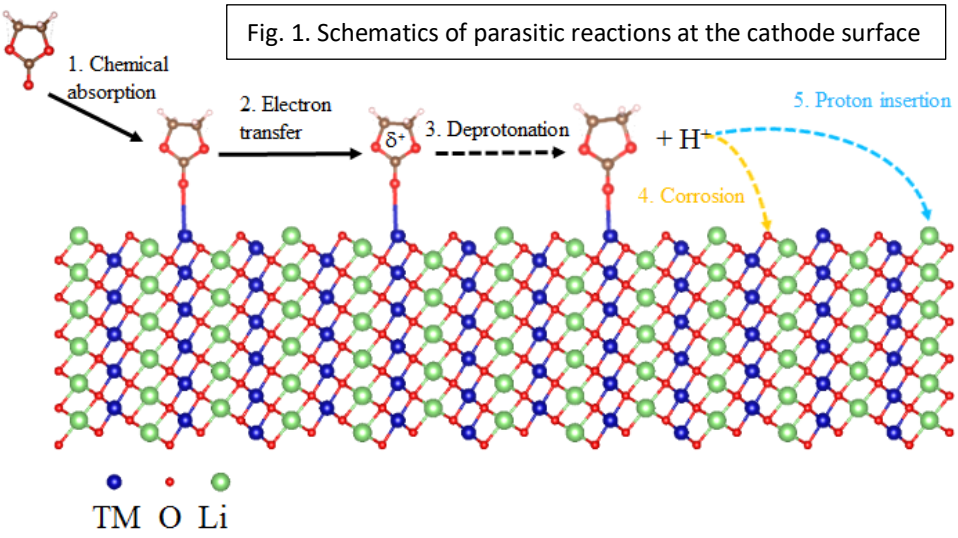
Thursday, March 28, 2019

Room 102, Houston Science Center
10:00 a.m. – 11:00 a.m.

Chasing Protons in Lithium Batteries

ABSTRACT: Nickel-rich lithium transition metal oxides have been recently considered as one of most promising cathode materials for high energy density lithium-ion batteries. However, the instability of the cathode electrolyte interface has been the major technological barrier for the development of nickel-rich cathodes. The early research has simply assigned this interfacial instability to the electrochemical oxidation of the commonly used carbonate solvents without much discussion on the nature of the parasitic reactions. A proprietary high precision electrochemical system was built in-house to quantitatively measure the rate and kinetics of the side reactions between the delithiated cathode and the non-aqueous electrolyte. Our results clearly indicated the dominant chemical reaction within the working potential window is the chemical, not electrochemical, reaction between the intermediate phase of cathode and the electrolyte, generating locally concentrated protons at the surface of the cathode materials. Figure 1 shows a generic mechanism of parasitic reactions occurring at the interface of cathode materials. Additional help from advanced characterization tools, such as synchrotron probes, will also be discussed.

Fig. 1. Schematics of parasitic reactions at the cathode surface



BIO: Dr. Zonghai Chen, chemist at Argonne National Laboratory from 2004 to present**,** received his B.S. degree (1997) and M.S. degree (2000) from the University of Science and Technology of China, and Ph.D. degree (2004) from Dalhousie University in Canada. His research interest includes functional electrolytes and electrode materials for advanced lithium batteries, with particular focus on behavior of materials at extreme conditions and interfacial processes in lithium batteries.

TcSUH Host: Prof. Yan Yao

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