

Role of Solvent and Support in Oxygen Reduction and Evolution in Metal-Air Batteries

Andrew A. Gewirth

Department of Chemistry, University of Illinois

Abstract

In this talk, we report on electrochemical, mass spectrometric, and NMR spectroscopic studies on the products and activity of different solvents and catalysts for metal-air batteries. We use differential electrochemical mass spectrometry (DEMS) to characterize the Li-O₂ battery in an electrolyte containing tetraethylene glycol dimethyl ether (TEGDME) and lithium triflate (LiOTf) and examine the effect of several cathode catalysts. Au nanoparticles increase the amount of O₂ evolved during charge and improve the cycleability of the cell. In contrast, Pt, Pd, and Cu(II) oxide catalysts are detrimental to battery performance because they catalyze solvent or carbon cathode decomposition as evidenced by CO₂ evolution. Regardless of the catalyst employed, the amount of O₂ measured upon charge is significantly less than that expected for complete Li₂O₂ formation and decomposition, in agreement with the rapidly fading capacity observed during battery cycling. Detailed NMR studies, incl