

Electrolytes enabling Li and Na metal devices – from polymer electrolytes to ionic liquids.

M. Forsyth¹, P. C. Howlett¹ and D.R. MacFarlane²

Institute for Frontier Materials (IFM), Deakin University, Burwood, Victoria 3125, Australia ¹

School of Chemistry, Monash University, 3800 Victoria, Australia²

maria.forsyth@deakin.edu.au

The holy grail of energy storage is battery technology based on Lithium metal anodes, with Sodium metal being a close second contender electropositive metals, both Li and Na provide possibilities for reversible, high energy density devices for use from electric vehicles to grid storage. These may include in conventional devices where an intercalating cathode is used, or in Li/Na-sulphur or Li/Na-air configurations.

A significant problem with both metals is the ability to cycle the electrode without creating dendritic morphology, which can cause poor cycling efficiency, dangerous short circuits and failures in a battery. Polymer electrolytes, and more recently ionic liquid based systems, have shown great promise for stable cycling of Li and Na. This talk will span the trajectory of polymer and ionic liquid electrolytes, from the early, traditional polyethylene oxide based electrolytes through to novel single ion conducting ionomers and finally the highly concentrated mixed ionic liquid electrolytes that appear to produce a stable interphase layer, so that, despite somewhat lower ionic conductivities than the traditional organic solvent electrolytes, excellent device performance is achievable.