The quest for the 100,000 cycle battery: cycle life challenges and opportunities in defective, low cost materials

Electrochemical energy storage induces headaches in industrialists for the same reason it provides such fertile ground for academics: a working, rechargeable battery represents a tight coupling of multiphase phenomena across mechanical, thermal and electrical domains. The properties of battery materials have been well classified in the literature in an anatomical fashion, but systematic treatments of the composite battery electrode and complete storage device have been less rigorous. By understanding and compensating for certain material disadvantages through complete cell modification, we have preliminary evidence that the zinc alkaline system can meet grid scale requirements (for both cost and performance). In particular, by focussing and optimizing defect structure in our cathodic electrodes, we hope to develop straightforward electrochemical techniques to maintain performance across many cycles.