
Deformation in batteries during charging and discharging

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Abstract

Despite the emergence as the archetype for energy storage, lithium ion batteries did not reach their possible full potential, partly owing to difficulties in understanding multiphysics mechanisms occurring collectively and differently in charging and discharging. Specifically deformation is often left aside although in a conventional lithium ion, 5% strain is usually detected during ions entering and intercalating the electrode. With such geometric nonlinearities, we discuss a unified theory for thermomechanics and electromagnetism due to diffusion of charged particles leading to a set of coupled and nonlinear equations. Since the formulations are in different frameworks, numerical implementation is an open problem. In this talk, we observe a possible approach by using the finite element method and open-source packages.

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