

1172-35-168

Yiwei Wang* (ywang487@iit.edu), **Chun Liu** (cliu124@iit.edu) and **Robert S Eisenberg** (bob.eisenberg@gmail.com). *On variational principles for polarization in electromechanical systems.*

Classical electrodynamics uses a dielectric constant to describe the polarization response of electromechanical systems to changes in an electric field. In this talk, we will present a unified, thermodynamically consistent, variational framework for modeling electromechanical systems as they respond to changes in the electric field. This framework is motivated and developed using the classical energetic variational approach (EnVarA). The coupling between the electric part and the mechanical part is described either by Lagrange multipliers or various energy relaxations. As an illustration, we rederive the classical PNP equation by both approaches. The new framework can be used to model many electromechanical systems found in many physical and biological applications, such as ion transport in membranes, batteries, and dielectric elastomers. (Received August 25, 2021)