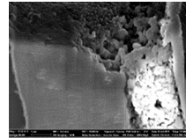
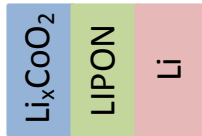


# Nonlinear Impedance Spectroscopy of Battery Materials

Wei Lai, Assistant Professor, Michigan State University

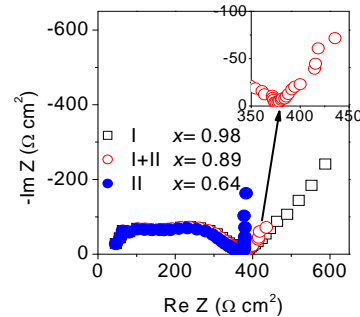
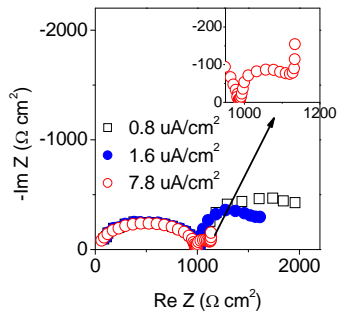
**Objective:** study the complex kinetics in bulk and interfacial transport of battery materials

**“Complex” impedance response**

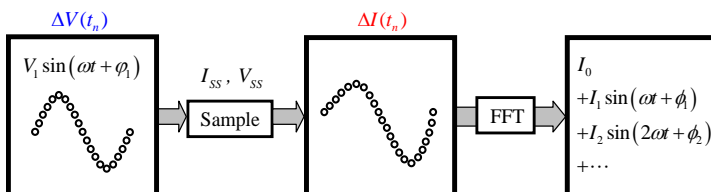


coupled bulk&interface

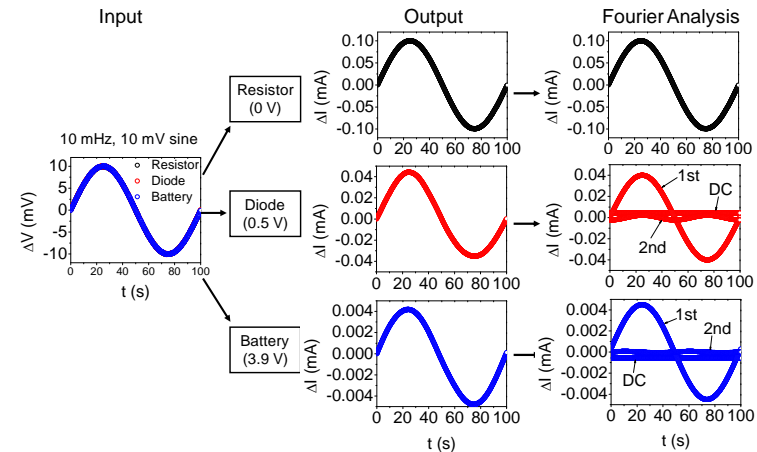
phase transformation



**Fourier analysis based NIS**



**Experimental demonstration**

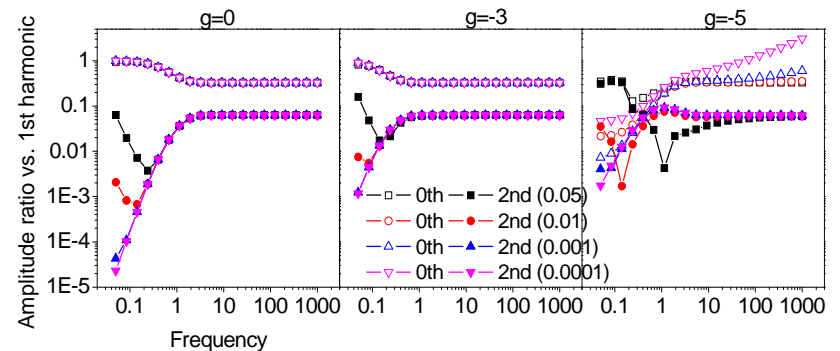


**Phase field modeling**

solid solution with constant diffusivity

solid solution with variable diffusivity

phase transformation



1. W. Lai, *Electrochim. Acta*, 55, 5511 (2010)
2. W. Lai, *J. Power Sources*, 196, 6534 (2011)