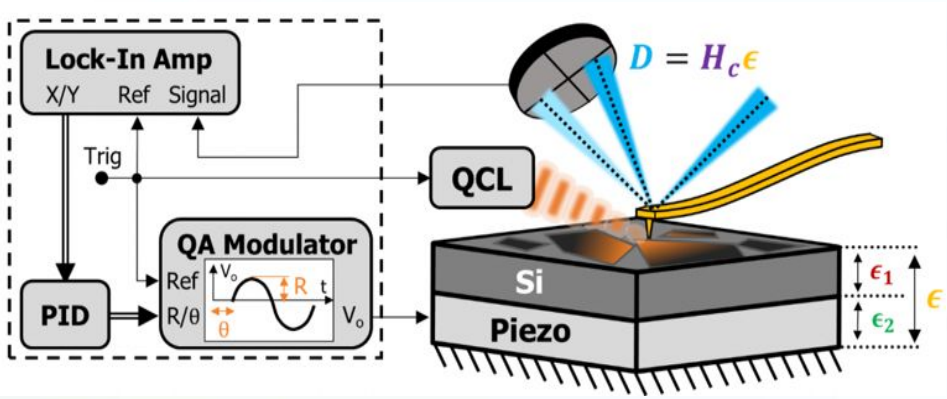
Illinois MRSEC
DMR-1720633

2020

Molecular Characterization of Nanomaterials by Closed-Loop Atomic Force Microscopy-Infrared (AFM-IR) Spectroscopic Imaging

R. Bhargava
University of Illinois Urbana-Champaign

Atomic force microscopy-infrared (AFM-IR) spectroscopic imaging offers a route to simultaneously achieve structural and molecular characterization of interfaces, but it requires careful sample preparation and often relies on signal enhancement using gold or custom polymer-coated substrates. The Bhargava group demonstrated a new closed-loop piezo controller design for responsivity corrected AFM-IR to achieve accurate, nanoscale chemical imaging. The working principle of the new design controls and records the voltage applied to a subsample piezo to maintain a state of zero cantilever deflection. Accurate infrared absorption of nanothin materials, as demonstrated using PMMA films on glass and silicon were demonstrated. These methods and analytical theory open a new, robust way to map nanoscale molecular information on common substrates, including 2D materials.



Principle of operation of closed-loop piezo controller AFM-IR for nanothin materials.

Kenkel et al. *Nature Communications, revision under review.*