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Visualizing the Subsurface of Soft Matter: Simultaneous Topographical Imaging, Depth Modulation, and Compositional Mapping with Triple Frequency Atomic Force Microscopy[1] SANTIAGO SOLARES, DANIEL EBELING[2], BABAK ESLAMI, Univ of Maryland-College Park — Characterization of subsurface morphology and mechanical properties with nanoscale resolution and depth control is of significant interest in soft matter fields like biology and polymer science, where buried structural and compositional features can be important. However, controllably "feeling" the subsurface is a challenging task for which the available imaging tools are relatively limited. This presentation describes a trimodal atomic force microscopy (AFM) imaging scheme, whereby three eigenmodes of the microcantilever probe are used as separate control "knobs" to simultaneously measure the topography, modulate sample indentation by the tip during tip-sample impact, and map compositional contrast, respectively. This method is illustrated through computational simulation and experiments conducted on ultrathin polymer films with embedded glass nanoparticles. By actively increasing the tip-sample indentation using a higher eigenmode of the cantilever, one is able to gradually and controllably reveal glass nanoparticles that are buried tens of nanometers deep under the surface, while still being able to refocus on the surface.

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