M1

Utilizing Scanning Electron Microscopy to Characterize Conductive AFM Tip Degradation and Microsphere Deposition

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Scanning Electron Microscopy (SEM) is a method by which the morphology of a sample can be determined. Energy Dispersive X-ray Spectroscopy (EDS) can determine the elemental composition of the sample. This project examined two microsystems using these techniques. The first microsystem examined the quality of the coating on Atomic Force Microscopy (AFM) tips. In contact AFM, a tip is physically dragged across the surface to determine the topography of the sample. The SCM model tips have a conductive coating, which can be damaged due to the dragging required to make the measurement. In the second microsystem, the SEM was used to examine the results of depositing polystyrene microspheres on gold substrates to determine what parameters lead to a close-packed monolayer.

M2

Phase Transfer of Gold-Silver Alloy Nanoparticles

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Nanoparticles observable properties change with variation in shape, composition, size and the medium in which they are dissolved. Changing any of these factors influences the catalytic ability as well as the absorbance spectra of the nanoparticle. The project's aim was to transfer gold-silver alloy nanoparticles from an aqueous medium into a variety of nonpolar solvents. Small spherical nanoparticles were made with varying composition of gold and silver and then transferred from water into chloroform, dichloromethane, and toluene using various phase transfer catalysts. Absorbance spectra taken before and after transfer were compared to prove the transfer. The UV-VIS spectra showed a linear correlation of the maximum absorbance peak with the refractive index. Modeling using Mie theory was also performed to investigate the predictability of the shift in spectra with respect to alloy and solvent composition.