

Computer Simulation of Chemical Etching Processes.

Sponsor: Prof. Paulette Clancy, in collaboration with Prof. Jane Chang (UCLA). Graduate Student: Blaire Sorenson (MSE)

One or two MS students, or a team of 1-2 M.Eng. students, with variable credit of 3-4 credits in the fall and 3-4 credits in the spring.

Chemical etching is a manufacturing method that is also referred to as photo-etching, or electrochemical etching, and other terms. The technique stems from optical lithography. Chemical etching is a subtractive manufacturing process that removes metal in order to produce metal parts in a desired shape and thickness. This is a collaborative project with Prof. Jane Chang and her student at UCLA where their experimental research activities are focused on the synthesis and patterning of multi-functional complex oxide films with tailored electronic, chemical, thermal, mechanical, and biological properties. This project will study solvent-film interactions and resulting electronic properties to understand solvent selectivity in the chemical etching process. It has been observed experimentally that some solvents used are not successful in etching metals. Whether etching occurs is highly dependent on the material of the film, and the solvent used. This project will use computational tools, both Density Functional Theory (DFT) and Molecular Dynamics (MD) to study the effects of various solvents on the thin films being etched. We will teach students these two techniques, but the project is better suited to students with some programming skills (C, C++, python etc.) and enthusiasm for coding.