Wet Etching Trials on Multi-Layer Metallic Films for Display Technologies

Overview
H.C. Starck would like to etch bimetallic molybdenum and copper thin films for display technologies in minimal processing steps by optimizing industry standard etchants. The company delivered multiple double-layer films with varying thicknesses and/or compositions and the team conducted etching experiments by varying etchant temperature. Etch success was determined via optical microscopy, SEM, and EDS. A literature review also accompanied the experiments and data analysis.

Objectives
The main goals were to investigate and understand the parameters that affected the amount of metallic residue present on film and the taper angle and step of the molybdenum layer.

Approach
- A literature review was conducted to familiarize the team with common wet etching practices.
- Members were first trained on all appropriate equipment in the cleanroom at the Millennium Science Complex.
- Initial single and bimetallic films were deposited by and received from the sponsor company.
- The films were patterned via photolithography.
- Testing was performed by submerging each sample in an etchant bath at a predetermined temperature until all the desired metal was etched away.
- The time for the metal to dissolve was recorded and the metal surfaces were characterized via optical microscopy, field emission scanning electron microscopy, and energy dispersive spectroscopy.
- Statistical data was generated for etch times and SEM images were viewed to see which samples had the least residue and the smallest molybdenum step.
- The team narrowed the testing parameters based on which etch profiles were more ideal and continued testing on different alloyed films that were received from the company.

Outcomes
- The project provided the sponsor with relevant data and images comparing etch profiles.
- Optimal parameters were determined and given to H.C. Starck.
- The project showed that a higher temperature for etching and an
alloyed molybdenum layer resulted in the best etch profiles.