# Northern California Chapter of the AVS (NCCAVS) Poster Session February 26, 2026 Fremont, CA USA

## Atomic Layer Etch Process for Nb and Ta Using $CF_4/H_2$ Plasma

*Ryan Walsh, Mikeal B. Macera , Russ Renzas*
University of Nevada, Reno

Cyclic atomic layer etch processes were developed for sputtered Nb and Ta thin films using CF4/H2 ICP plasma and Ar irradiation. The processes were investigated as a function of CF4/H2 dose time, Ar exposure time, and RF substrate bias. Etch per cycle, synergy, and surface roughness before and after etch are reported. Etch rates were similar for both materials for identical process conditions. A soft-saturated ALE process had etch rates of 0.23+/-0.02 nm/cycle for Nb and 0.23+/-0.01$ nm/cycle for Ta with a total cycle time of 16 seconds. Synergies were 87% and >99% for Nb and Ta, respectively. Selectivity to Si is also reported. These processes are promising for real-world devices which are sensitive to etch-induced damage, such as superconducting resonators.

## Advanced Electrode Design for High-Rate Alkaline Water Splitting

*Qiu Ren, Yat Li*
University of California, Santa Cruz

Alkaline water splitting (AWS) is an alternative technology for green hydrogen production. To meet industrial demands, it must operate at high current densities. However, under industrially relevant conditions, several challenges arise, including bubble accumulation, ion diffusion limitations, and sluggish anodic reactions. To address these issues, we advanced our electrode design through multiple strategies to maintain reaction efficiency.

## Sustainable Bioinspired Polymer–Mineral Composites for Adaptable Repair in Conservation Applications

*Zoe Weber-Porter, Rishima Agnihotri, Ashwin Marichetty, Marco Rolandi*
University of California, Santa Cruz

Every year, tens of thousands of tons of plaster-based materials are used in restoration and conservation applications, many of which are derived from non-renewable sources and discarded at the end of their service life. Here, we introduce a biodegradable, bio-derived composite based on chitosan and calcium carbonate that is composed of simple, widely available constituents and designed for adaptable repair applications. By varying polymer molecular weight, concentration, and mineral content, the composite can be formulated to span injectable, paste-like, and putty-like behaviors, enabling accommodation of diverse structural filling and stabilization needs. We examine relationships between composition, flow behavior, and mechanical performance through rheological characterization of the wet composite and measurements of bulk density, porosity, and compressive strength in the hardened state. Rather than targeting a single optimized formulation, this work demonstrates a tunable material platform in which relationships between composition, flow behavior and mechanical performance guide selection of material behavior based on application requirements. Future applications of this approach include sustainable repair and conservation materials for exhibits, architectural restoration, and other contexts where adaptable handling, mechanical integrity, and biodegradability are desired.