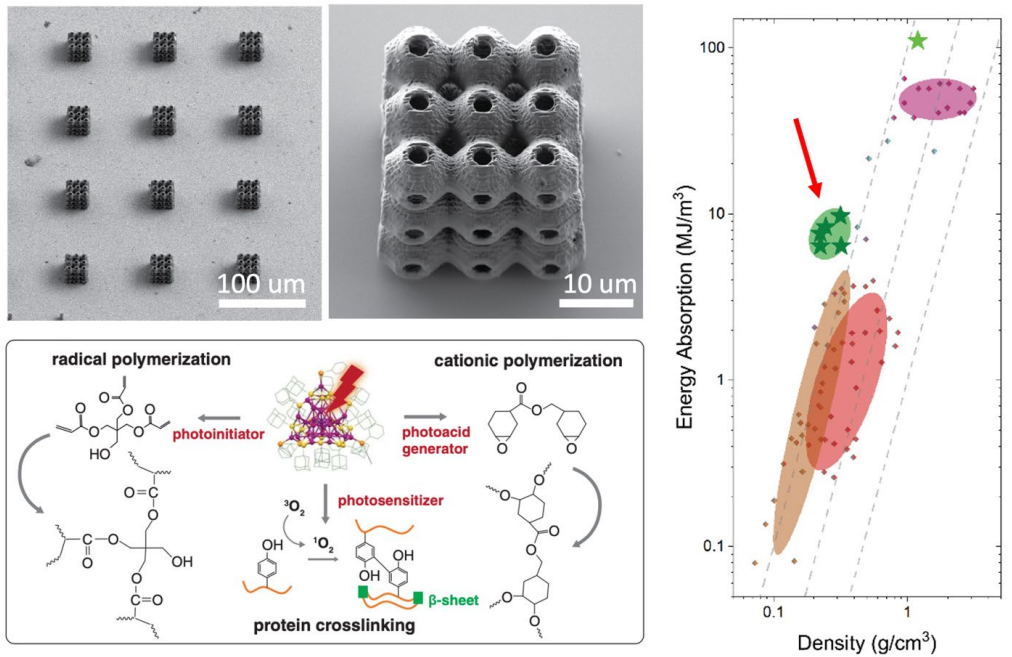
Manipulating Light-Matter Interactions in Metal Nanoclusters by Pressure

Xun Wendy Gu, Stanford University

- Nanoclusters were used in the 3D nanoprinting of mechanical nanolattices. The metal nanoclusters simultaneously function as highly sensitive two-photon initiators for efficient and high-resolution printing and inorganic precursors for mechanical reinforcements. Nanocomposite pillars, octet lattices and primitive triply periodic minimal surfaces were found to have record high strength, and mechanical energy absorption.
- We performed high-pressure single-crystal X-ray diffraction analysis of the $Au_{25}S_{18}$ metal nanocluster. We found that a 0.1 Å decrease of the Au−Au bond length could induce a blue-shift of 30 nm in the photo-luminescence spectra of these nanoclusters.



Li*, Kulikowski*, Doan* et al., Science (2022)

Nanocluster-based photoresists are used to fabricate 3D periodic lattices which have best-of-class mechanical energy absorption. The nanoclusters enable printing of different polymers (e.g. acrylates, epoxies, and proteins).

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- This grant supported the training of Robert Tran, a math teacher at Lowell High School, who joined the group as a summer intern in 2022 through the Ignited Program. He returned to Lowell High School in the fall with a new lesson plan that included statistical analysis of mechanical measurements.
- Wendy co-organized the Rising Stars in Mechanical Engineering program, which took place in October 2022. This workshop provided 32 women from around the country with the opportunity to travel to Stanford and learn how to succeed on the academic job market and beyond.

Rising Stars in Mechanical Engineering workshop.