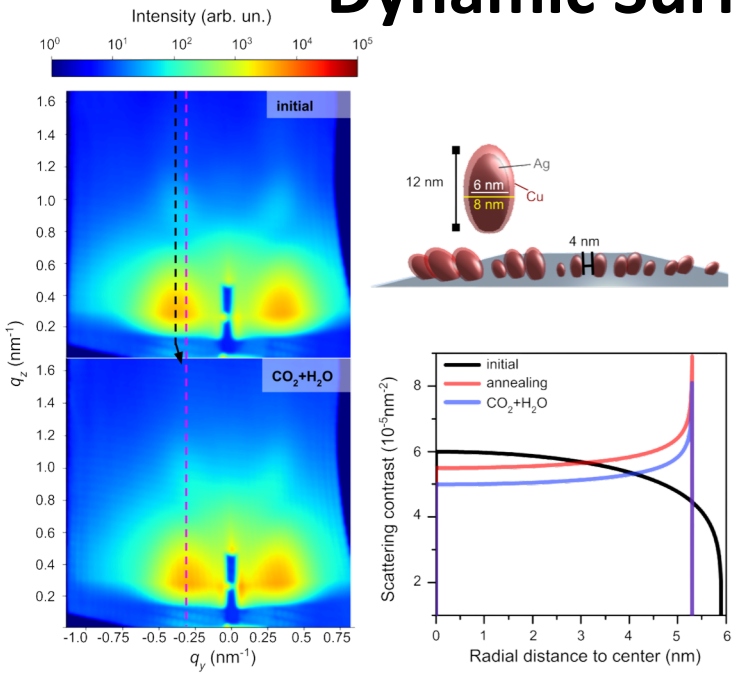
Dynamic Surface Restructuring in Ag-Cu Boosts CO_2 Conversion



Left: AP-GIXS sample scattering before and after carbon dioxide and water (CO_2+H_2O) exposure. Black and magenta lines indicate the nanoparticle size change. Right: (top) Nanoparticle parameters yielded by analysis; (bottom) Scattering contrast as a function of the radial distance to the surface of the average sized nanoparticle.

Scientific Achievement

Multimodal in situ x-ray experiments revealed the underlying mechanisms and evolution of copper–silver (Cu–Ag) nanoparticle catalysts during carbon dioxide (CO_2) photoreduction.

Significance and Impact

The new insights, showing a dynamic catalyst restructuring process, could improve the selectivity and efficiency of CO_2 conversion into high-value chemicals.

Research Details

- Ambient-pressure soft x-ray photoelectron spectroscopy and x-ray scattering at the Advanced Light Source (ALS) detailed the electron transfer between the Cu, Ag, and oxygen atoms during CO_2 conversion.
- ALS x-ray scattering data was compared to molecular dynamics simulations to model the size, shape, and electron distribution in the nanoparticles.

G.Z. Girotto, M. Jaugstetter, D. Kim, et al., *Adv. Mater.* e09814. doi.org/10.1002/adma.202509814.

Work was performed at ALS/Molecular Foundry.