

**ATOMISTIC MECHANISMS OF MOISTURE-INDUCED
FRACTURE AT NOBLE METAL-SILICA INTERFACES**

by

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Tailoring the chemo-mechanical properties of metal-dielectric interfaces is crucial for many applications including nanodevice wiring, packaging, composites and catalysis. Here, we combine moisture-induced fracture tests, electron spectroscopy and density functional theory calculations to reveal fracture toughness partitioning and atomistic delamination mechanisms at noble metal-silica interfaces. Copper-silica interfaces support copper plasticity above a threshold work of adhesion and delaminate by moisture-induced Cu-O bond scission in Cu-O-Si bridges, while gold plasticity is undetectable at gold-silica interfaces due to weak Au-O-Si bridges. These results provide insights into the effects of the nature of metal-oxygen bonding on moisture-induced delamination of metal-dielectric interfaces.