

On Demand

Atomic Layer Etching

Room On Demand - Session ALE3

Solution-based including Wet ALE

ALE3-1 Novel Electrochemical Concepts for Enabling Atomic Layer Etching of Metals, *Y. Gong, Theodore Phung, R. Akolkar*, Case Western Reserve University

In this talk, we will outline electrochemical concepts for achieving atomic layer-by-layer etching of interconnect materials such as copper and ruthenium used in semiconductor devices. By employing a two-step process comprising surface-limited electrochemical oxidation followed by selective etching of the surface oxide monolayer, we will demonstrate the atomic layer etching (electrochemical ALE) of copper and ruthenium. Characteristics of the electrochemical ALE process steps will be outlined using a suite of in situ and ex situ techniques including electrochemical measurements, quartz crystal micro-gravimetry, and high-resolution TEM or AFM. Finally, the critical role of the electrode potential in enabling layer-by-layer etching without surface roughness amplification will be highlighted. Underlying electrochemical mechanisms and thermodynamic considerations will be explained leading to guidelines for optimal electrochemical ALE process design.

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