Homoepitaxy-like growth and oxidation physics of copper thin film

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Due to the lattice mismatch with the substrate, the crystallinity of thin films and the electron motion is hindered by numerous grain boundaries, raising the question of whether the known physical properties, including electron transport in metal thin films, hold intrinsic.

However, the use of Atomic Sputtering Epitaxy (ASE) represents a pivotal step in uncovering the hidden physical properties of metal. The groundbreaking approach to thin film growth, involves the use of extended atomic distance mismatch (EADM) to circumvent the challenges posed by lattice mismatches. By growing thin films like homoepitaxy, despite heteroepitaxy, a longer mean free path and coherence length of electrons is achieved, thereby unlocking diverse physical phenomena.

Additionally, the novel concept of oxidation physics, treating oxidation as a vector quantity, is explored, opening up a range of possibilities. The novel notion of metaltronics, which seeks to introduce semiconductor properties into metal, is also presented, offering new applications for metals beyond traditional use as electrodes. Specifically, this study about copper single crystal thin film delves into the potential of copper, a metal we believed we knew all too well.

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