Quantum size effects in metallic ultra-thin films: surface energy, workfunction, and superconductivity

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In ultra-thin epitaxial metallic film, confinement of electronic states along the vertical direction leads to the formation of quantum well states (QWS). In recent years it has been recognized that such QWS have profound effects on the growth phenomena of thin metallic films, as well as many interesting physical and chemical properties of such thin films. This presentation focuses on experimental investigations of three aspects: (a) surface energy which is directly relevant to the quantum size effects on growth of ultra-thin metallic films; (b) quantum size effects on workfunction which has strong bearing on surface chemistry; and (c) superconductivity where the interplays of quantum confinement and superconductivity stiffness at nanometer length scale give rise to some very intriguing phenomena.