

Reduced Metallic Properties of Ligand-Stabilized Small Metal Clusters

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Low-temperature ultrahigh-vacuum scanning tunneling microscopy was employed to analyze the electronic behavior of Au₅₅ clusters stabilized by [P(C₆H₅)₃]₁₂Cl₆ ligands. At 7 K, the actual arrangement of the C₆H₅ rings of the ligand molecules could be imaged. Spectroscopic data reveal discrete energy levels with an average spacing of 170 meV that can be attributed to the Au₅₅ core. Additionally, characteristic charge-quantization phenomena were observed. Energy and charge quantization both support the view that the clusters consist of a metallic core extending slightly beyond the first close-packed shell of Au atoms.