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Size-effect driven ferromagnetism in gold nanoparticles[1] CHEN CHEN, Univ of Illinois - Chicago, BYRON WATKINS, JOHN B. KETTERSON, Northwestern University, JEREMIAH T. ABAIDE, Univ of Illinois - Chicago — Bulk gold (Au) is well-known to be a diamagnetic material. The occurrence of ferromagnetism in nanostructured gold would clearly be an interesting example of novel quantum phenomenon that emerges in materials with reduced dimensionality. Recently, several reports have suggested that gold is ferromagnetic in the nano-regime, particularly when capped with certain thiol-containing ligands. We have employed pulsed laser deposition (PLD) to prepare multiple layers of bare gold nanoparticles buried in nonmagnetic, disordered alumina thin films. Transmission electron microscopy (TEM) measurements show that, depending on conditions, the resulting particle sizes range from ˜1nm to ˜20nm. The size-dependent magnetic response of such samples was characterized using a SQUID magnetometer. Our experimental results provide direct evidence that size-effect driven ferromagnetism occurs in gold together with the critical size required for observing ferromagnetism. These results can be used as a guide for exploring magnetism in other metals that are diamagnetic in the bulk.

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