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Novel magnetic and electric properties of small pure gold clusters LEI MA, RAMIRO MORO, BAIQIAN ZHANG, JOHN INDERGAARD, ILIA LARKIN, Georgia Institute of Technology, HANNU HÄKKINEN, University of Jyväskylä, MARKUS KINDERMANN, WALT DE HEER, Georgia Institute of Technology, PROF. WALT A DE HEER TEAM, PROF. MARKUS KINDERMANN COLLABORATION, PROF.HANNU J HAKKINEN COLLABORATION — Cryogenic molecular beam magnetic and electric deflections of neutral gold clusters AuN (up to N=25), demonstrate novel properties. In contrast to normal spin half clusters that exhibit symmetric Stern-Gerlach deflections with a high-field-seeking and a low-field-seeking component, here we show that small odd-N gold clusters that are cryogenically fully cooled exhibit only the high-field-seeking (paramagnetic) component. In contrast, the magnetization of undercooled, metastable gold clusters almost exactly reverses so that they are highly diamagnetic. Electric deflections of gold clusters are also anomalous. Analogously, while the polarizabilities of equilibrated clusters are normal, in the undercooled condition they are essentially equal and opposite (with an offset) to the fully cooled case. Some clusters even have negative polarizabilities so that they are repelled by the electric field. Giant diamagnetism and negative polarizabilities, reported here for the first time, are observed in gold clusters, but not in copper clusters. A simple two-level model explains some of the effects and suggests laser applications.

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