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Emerging Magnetism at Pt Nanocontacts and Nanowires
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Nanocontacts made of transition metals that are nonmagnetic in bulk may display a possible onset of Hund's rule local nanomagnetism. Zero-temperature DFT electronic structure calculations indicate that magnetism may occur in monatomic nanowires of 4d and 5d transition metals, generally favored by tensile stress, and sometimes also by spin-orbit coupling.[1] In the particular case of a Pt monatomic nanowire, resurgence of orbital magnetism is predicted to conspire with intra-atomic exchange to give rise to a spontaneous magnetization even at zero stress. Here we expect an extraordinarily large magnetic anisotropy, spin and orbital magnetization lying strictly parallel to the nanowire axis. A Pt nanowire-like contact should thus behave as an Ising nanomagnet. Since magnetic exchange splittings generally affect the number of conducting channels crossing the Fermi level, it is likely that the ballistic conductance through a nanowire-like contact[2] will be affected by the emerging nanomagnetism of Pt. [1] A. Delin and E. Tosatti, Phys. Rev. B 68, 144434 (2003); A. Delin, et al., Phys. Rev. Lett. 92, 057201 (2004). [2] A. Smogunov, A. dal Corso and E. Tosatti, Surface Science 507, 609 (2002); ibid. Surf. Sci. 532, 549 (2003); ibid. Surf. Sci. 566, 390 (2004); A. Smogunov et al., Phys. Rev. B 70, 045417 (2004); and to be published.

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