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Spin dynamics in atomically assembled antiferromagnets SEBASTIAN LOTH, Max Planck Research Group - Dynamics of Nanoelectronic Systems, Center for Free-Electron Laser Science, Hamburg, Germany — Antiferromagnetic materials possess ordered magnetic states that have vanishing magnetization. We used a low-temperature scanning tunneling microscope to construct few-atom antiferromagnets. Even-numbered arrays of antiferromagnetically coupled atoms were found to have no net spin. Their shapes can be defined precisely by atom manipulation avoiding uncompensated magnetic moments at the nanoparticle's edge. We use such spin-compensated atomic arrays to study the intrinsic dynamics of nanoscale antiferromagnets [1]. For chains of more than four atoms we observe two Neel-ordered ground states and frequent switching between them. The spontaneous switching rates depend strongly on the number of coupled atoms and we observed magnetic tunneling of the Neel vector for the smallest structures. In arrays with ten or more atoms the residence time in each state can exceed many hours but current-induced switching proceeds at nanosecond speed. These properties enable a model demonstration of dense magnetic data storage that uses antiferromagnets as memory elements. [1] S. Loth, S. Baumann, C. P. Lutz, D. M. Eigler and A. J. Heinrich, Science 335, 196 (2012).

Sebastian Loth
Max Planck Research Group - Dynamics of Nanoelectronic Systems,
Center for Free-Electron Laser Science, Hamburg, Germany

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