Magnetic spin on non-magnetic materials

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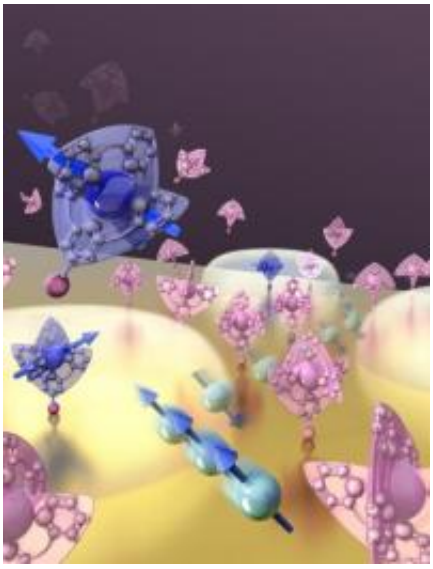

(PhysOrg.com) -- Nanotechnologists from the University of Twente's MESA+ and MIRA research institutes have developed a method for incorporating magnetic elements into non-magnetic materials in a highly controlled way. Using this technique, it is possible to drastically change the electrical behaviour of metals and even to give semiconductors magnetic properties. The results have been published in leading scientific journal *Nature Nanotechnology*.

University of Twente researchers were able to incorporate magnetic elements into a non-magnetic layer of gold in a highly controlled manner. They did so by coating the gold layer with a single layer of

organic molecules, each containing a single metal ion: some containing cobalt and some containing zinc. The cobalt ions have an unpaired electron spin and therefore behave as an elementary magnet, while zinc ions do not have magnetic properties. By adjusting the relative concentration of cobalt and zinc ions, it is possible to fine tune the magnetic properties of the final material. Molecular self-assembly causes the metal compounds to spread homogenously over the layer of gold.

What makes the method so special is that it produces unprecedentedly high concentrations of magnetic "doping" without causing the magnetic elements to cluster. In the methods used to date, it was very difficult to spread the magnetic elements homogenously over the final material, particularly at high concentrations.

Using the method developed at the University of Twente, it is possible to create materials with completely new properties. This paves the way for semiconductors with magnetic properties: one of the holy grails of physics. Semiconductors of this kind could be used for both memory storage (magnetic) and data processing (electrical) in a new generation of computers.

More information: The method is described in an article entitled 'Tunable doping of a metal with molecular spins', which appears in the April issue of *Nature Nanotechnology* (doi:10.1038/nnano.2012.1)

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