Advances In The Structuring And Patterning Of Single-Molecule Magnets On Surfaces

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Single-molecule magnets (SMM), derived from Mn_{12} molecules, have a large high-spin ground state (S = 10) with appreciable magnetic anisotropy resulting in a barrier for the spin reversal. As a consequence, an interesting magnetic bistability, due to individual molecules rather than to long-range ordering, is observed. Such molecules may therefore become materials with a potential impact in ultra-high density magnetic storage and quantum computation, provided they can be organized into addressable domains.

Here we present new methods, based on unconventional parallel lithography, for patterning Mn_{12} SMMs on a large area and with nanometer resolution on surfaces with different nature. The first method uses a stamp-controlled deposition of molecules from a solution and exploits the competing interactions between the molecules and a substrate permitting the nanopatterning of Mn_{12} molecules on the surface.[1] In the second method, a Mn_{12} derivative has been used to fabricate patterns of magnetic bits on a polycarbonate polymeric surface by a modified micro-transfer molding with a subsequent solvent exposure. This system can be used effectively as a permanent information medium with magnetic readout.[2] Finally a method that permit the structuring of Mn_{12} molecules in the form of nano-objects will be presented.

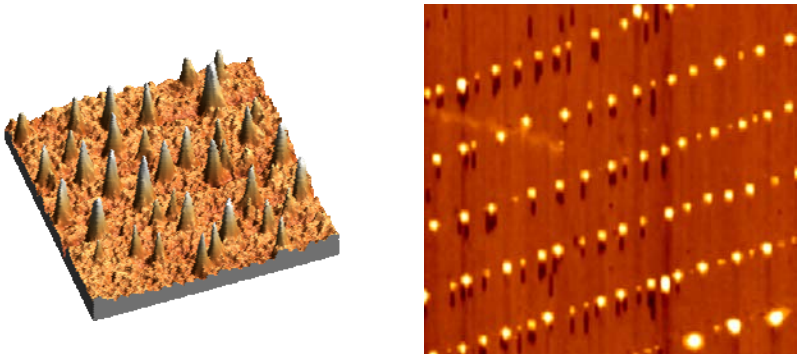

Figure. Left: Isolated Mn_{12} SMM appearing at a polymeric surface. Right: Patterned surface with aggregates of Mn_{12} SMM.

[1] M. Cavallini, J. Gómez, D. Ruiz-Molina, F. Biscarini, J. Veciana. *Nano Lett*. **2003**, *3*, 1527.
[2] M. Cavallini, J. Gómez, D. Ruiz-Molina, F. Biscarini, C. Albonetti, C. Rovira, J. Veciana, F. Biscarini, *Angew. Chem. Int. Ed*., **2005**, *44*, 888.