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Roberta Sessoli developed her career at the University of Florence where she is full professor since 2012. She played a key part in the original discovery of single-molecule magnets (SMM), a broad class of molecular materials in which non-interacting molecules exhibit magnetic memory (hysteresis and coercive field) and quantum effects. This seminal discovery opened up an entirely new field for scientists, towards nanotechnologies. Her current interests include the interplay between magnetism and chirality, magnetic molecules on surfaces to form hybrid interfaces for spintronics, and molecules with highly coherent spin dynamics for quantum information.

For her scientific achievements, she has been selected as a member of the Science and Technology Advisory Council of the President of the European Commission and she received prestigious prizes such as the Centenary Prize of the Royal Society of Chemistry (2019), the Distinguished Woman in Chemistry award from IUPAC (2015), the Lecoq de Boisbaudran award from the European Rare Earths Society (2015), and the Agilent Technologies Europhysics prize (2002). In 2010 she has been awarded with an ERC Advanced Grant.

Magnetic Molecules for the Second Quantum Revolution: Opportunities and Challenges

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Implementation of modern Quantum Technologies might benefit from the remarkable quantum properties shown by molecular spin systems.[1] The versatility of the molecular approach combined with rational design has recently boosted the operativity temperature of Single-Molecule Magnets or the coherence time of molecular spin qubits. However, the molecular approach also poses key challenges, requiring for instance to overcome limitations such as those induced by low energy vibrational modes typical of molecular lattices. A lot remains to be done to achieve the capability to switch spin-spin interactions and to manipulate single molecule spins efficiently.

Molecules can, however, be processed to be deposited on surfaces, allowing the realization of hybrid nanostructures. Combining molecules with superconductors has allowed observing a tuneable interaction of the molecular spin with the Cooper pairs of an underlying superconducting thin film.[2] At the same time, the condensate state of the superconducting substrate can be used to switch a SMM into the quantum tunneling regime.[3] The organization of magnetic molecules on surfaces is also of relevance to achieve an electric control of the interaction between molecular spins.[4] An overview of our recent results will be provided.

References

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