physikalisches Kolloquium

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Reading out spin states of single molecules: application to Grover's algorithm

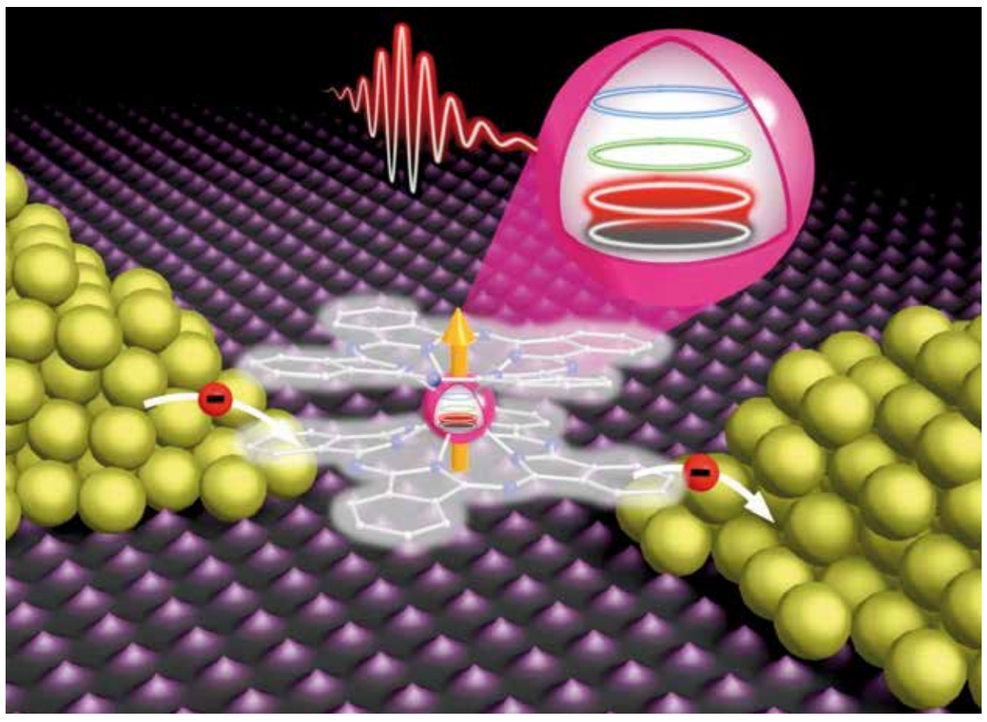
Mo. 05.12.16
16:00 Uhr
Ort: H34

The endeavour of quantum electronics is driven by one of the most ambitious technological goals of today's scientists: the realization of an operational quantum computer.

We start to address this goal by the new research field of molecular quantum spintronics, which combines the concepts of spintronics, molecular electronics and quantum computing [1]. The building blocks are magnetic molecules, i.e. well-defined spin qubits. Various research groups are currently developing low-temperature scanning tunnelling microscopes to manipulate spins in single molecules, while others are working on molecular devices (such as molecular spin-transistors, spin valves and filters, and carbon-nanotubebased devices) to read and manipulate the spin state and perform basic quantum operations.

We will first discuss this - still largely unexplored - field and then summarize our first results [2-5]. Finally, we will discuss the new challenges of the field and the requirements to achieve them.

[1] L. Bogani, W. Wernsdorfer, Nature Mater., 2008, 7, 179.
[2] M. Urdampilleta, S. Klyatskaya, M.-P. Cleuziou, M. Ruben, W. Wernsdorfer, Nature Mater., 2011, 10, 502.
[3] A. Candini, S. Klyatskaya, M. Ruben, W. Wernsdorfer and M. Affronte, Nano Lett., 2011, 11, 2634.
[4] S. Thiele, F. Balestro, R. Ballou, S. Klyatskaya, M. Ruben, W. Wernsdorfer, Science, 2014, 344, 1135; Nature, 2012, 488, 357.
[5] M. Ganzhorn, S. Klyatskaya, M. Ruben, W. Wernsdorfer, Nature Nanotechnol., 2013, 8, 165; Nature Comm., 2016, 7, 11443.



Above:
A molecular spin transistor based on a single TbPc2 molecular magnet.