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Electronic readout of a single nuclear spin using a molecular spin transistor R. VINCENT, Institut Neel, CNRS, Grenoble, S. KLYASTSKAYA, M. RUBEN, INT and KIT, Karlsruhe, Germany, W. WERNSDORFER, F. BALESTRO, Institut Neel, CNRS, Grenoble — Quantum control of individual spins in condensed matter devices is an emerging field with a wide range of applications ranging from nanospintronics to quantum computing [1,2]. The electron, with its spin and orbital degrees of freedom, is conventionally used as carrier of the quantum information in the devices proposed so far. However, electrons exhibit a strong coupling to the environment leading to reduced relaxation and coherence times. Indeed quantum coherence and stable entanglement of electron spins are extremely difficult to achieve. We propose a new approach using the nuclear spin of an individual metal atom embedded in a single-molecule magnet (SMM). In order to perform the readout of the nuclear spin, the quantum tunneling of the magnetization (QTM) of the magnetic moment of the SMM in a transitor-like set-up is electronically detected. Long spin lifetimes of an individual nuclear spin were observed and the relaxation characteristics were studied. The manipulation of the nuclear spin state of individual atoms embedded in magnetic molecules opens a completely new world, where quantum logic may be integrated.

[1] L. Bogani, W. Wernsdorfer, Nature Mat. 7, 179 (2008).
[2] M. Urdampilleta, S. Klyatskaya, J.P. Cleuziou, M. Ruben, W. Wernsdorfer, Nature Mat. 10, 502 (2011).

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