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Proposal for better control of single molecule magnets for quantum information storage[1] FATEMEH ROSTAMZADEH RENANI, GEORGE KIRCZENOW, Simon Fraser University — A molecular nano-magnet (MNM) is a single molecule that contains transition metal atoms that endow it with a stable magnetic moment. Transistors based on MNMs are potential candidates for spintronic devices and information storage. Knowledge of the orientation of the molecule's easy axis relative to leads is important for potential spintronic applications of MNMs but it has not been experimentally controllable. Our calculations reveal the possibility of determining the easy axis orientation experimentally by means of current measurements: We find the lowest unoccupied molecular orbital (LUMO) of the Mn_{12}-benzoate MNM to be on ligands, unlike the highest occupied molecular orbital which is on the Mn_{12} magnetic core. Therefore, we predict transport via the LUMO not to be subjected to Coulomb blockade. We predict gate controlled switching between Coulomb blockade and coherent resonant tunnelling in transistors based on such MNMs. We propose that this effect can be used to identify specific experimentally realized MNM transistors in which the easy axis is approximately parallel to the direction of the current flow.

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