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The first radical-based spintronic memristors: Towards resistive RAMs made of organic magnets KARIN GOSS, FLORIAN KRIST, SIMON SEYFFERLE, UDO HOEFEL, 1. Physikalisches Institut, University of Stuttgart, ALEXA PARETZKI, Institut fuer Anorganische Chemie, University of Stuttgart, MARTIN DRESSEL, LAPO BOGANI, 1. Physikalisches Institut, University of Stuttgart, 1. PHYSIKALISCHES INSTITUT, UNIVERSITY OF STUTTGART TEAM, INSTITUT FUER ANORGANISCHE CHEMIE, UNIVERSITY OF STUTTGART COLLABORATION — Using molecules as building blocks for electronic devices offers ample possibilities for new device functionalities due to a chemical tunability much higher than that of standard inorganic materials, and at the same time offers a decrease in the size of the electronic component down to the single-molecule level. Purely organic molecules containing no metallic centers such as organic radicals can serve as an electronic component with magnetic properties due to the unpaired electron in the radical state. Here we present memristive logic units based on organic radicals of the nitronyl-nitroxide kind. Integrating these purely molecular units as a spin coated layer into crossbar arrays, electrically induced unipolar resistive switching is observed with a change in resistance of up to 100%. We introduce a model based on filamentary reorganization of molecules of different oxidation state revealing the importance of the molecular nature for the switching properties. The major role of the oxidation state of these paramagnetic molecules introduces a magnetic field dependence to the device functionality, which goes along with magnetoresistive charactistics observed for the material. These are the first steps towards a spintronic implementation of organic radicals in electronic devices.

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