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Polyoxometalates as spin qubits A. GAITA-ARIÑO, Dept. Physics and Astronomy, U. of British Columbia, M. ALDAMEN, J.-M. CLEMENTE-JUAN, E. CORONADO, Molecular Science Institute, U. of Valencia, J. LEHMANN, D. LOSS, Dept. Physics and Astronomy, U. of Basel, P. STAMP, Dept. Physics and Astronomy, U. of British Columbia — Polyoxometalates (POMs) are discrete fragments of metal oxides, clusters of regular MO_n polyhedra. POMs show a remarkable flexibility in composition, structure and charge state, and thus can be designed according to specific electric and magnetic needs. The two localized spins with S = 1/2 on the V atoms in $[PMo_{12}O_{40}(VO)_2]^{q-}$ can be coupled through the delocalized electrons of the central core. This system was recently used for a theoretical scheme involving two-qubit gates and readout: the electrical manipulation of the molecular redox potential changes the charge of the core and thus the effective magnetic exchange between the qubits. Polyoxometalates can encapsulate magnetic ions, protecting them by a diamagnetic shell of controlled geometry. A great potential of POMs as spin qubits is that they can be constructed using only even elements, such as O, W, Mo and/or Si. Thus, there is a high abundance of polyoxometalate molecules without any nuclear spin, which could result in unusually low decoherence rates. There is currently an effort involving highly anisotropic, high magnetic moment, lanthanide@polyoxometalate molecules acting as spin qubits.

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