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Coupling between molecular spin cluster qubits MARCO AFFRONTE, CNR-INFM-S3 — Supramolecular chemistry enables nanoscale engineering of scalable structures, by introducing controlled interactions between well defined molecular building blocks. The ability to assemble weakly-interacting subsystems is a prerequisite for implementing quantum-information processing (QIP) and generating controlled entanglement. In recent years, molecular nanomagnets (MNMs) have been proposed as suitable candidates for the qubit encoding and manipulation. In particular, antiferromagnetic Cr7Ni rings at low temperature behave as effective spin-1/2 systems and exhibit long decoherence times. Here we show that these rings can be linked to each other through supramolecular functional groups, which allow an extensive tuning of the coupling between their spins. We demonstrate that maximally entangled states can be deterministically generated in tripartite supramolecular assemblies, formed by two Cr7Ni rings and a Cu ion, by simulating the system's time evolution under the effect of realistic microwave pulse sequences (under consideration Nature Nanotechnology).

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