

**A NEW FAMILY OF SINGLE MOLECULE MAGNETS WITH
CONTROLLABLE SPIN DECOHERENCE TIME: Cr^{II}-Cr^{II}-Cr^{II} LINEAR
CHAIN METAL-ORGANIC COMPLEXES**

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There is currently strong interest in developing magnetic materials in which the spin decoherence time T_2 can be controlled, because T_2 is the basic parameter for any spin system to be used in a quantum computation device. Current techniques for increasing T_2 are (a) magnetic dilution (b) low temperatures and (c) high magnetic fields. We now report a fourth one: structures with multiply-oriented sites. The metal-organic complexes based on Cr^{II}-Cr^{II}-Cr^{II} complexes with dpa ligands (dpa = dipyridylamine) constitute such a class. Synthesis and magnetic characterization of the ground spin state $S = 2$ by *cw*, and pulsed EPR spectroscopy of these novel compounds will be presented. Strong orientation dependence of the decoherence time T_2 was characterized. By changing the orientation of the external magnetic field relative to the crystal at 1.50 K using pulsed EPR spectroscopy at 240 GHz, we are able to tune its T_2 continuously from less than 0.5 μ s to up to 2.6 μ s, the longest known for single crystalline molecular magnets. These observations can have implications for controlling spin relaxation and fluctuations in anisotropic spin systems in general.