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Multiferroic properties of the geometrically frustrated molecular spin-trimer compound TNN.CH3CN YASUMASA TAKANO, CHRISTOPHER AOYAMA, University of Florida, KOSUKE TAKADA, HIRONORI YAMAGUCHI, TOSHIO ONO, Osaka Prefecture University, Japan, YASUYUKI SHIMURA, TOSHIRO SAKAKIBARA, ISSP, University of Tokyo, Japan, MINSEONG LEE, EUN SANG CHOI, National High Magnetic Field Laboratory, YOSHITOMO KAMIYA, RIKEN, Japan, HIROKI NAKANO, University of Hyogo, Japan, CRISTIAN BATISTA, University of Tennessee, Knoxville, YUKO HOSOKOSHI, Osaka Prefecture University, Japan — A new route to multiferroicity has been proposed, which requires neither a Dzyaloshinskii-Moriya interaction nor lattice distortion [1]. In this scenario, electric dipole moments emerge from lifting of ground-state degeneracy in a spin triangle embedded in a frustrated geometry. Well known spin triangles such as {Cu}3 suffer from Jahn-Teller distortion, which preempts the scenario, whereas organic spin trimers with perfect C3 symmetry are promising candidates. We have investigated the new organic compound TNN.CH3CN, which consists of triangular-lattice layers of the spin trimer TNN—tris[4-(1-oxyl-3-oxide-4,4,5,5-tetramethylimidazolin-2-yl)phenyl]amine—incorporating CH3CN. The magnetic-field-temperature phase diagram constructed from magnetization, ac dielectric constant, specific heat, and magnetic torque consists of several multiferroically ordered phases, which are in excellent agreement with theory. [1] Y. Kamiya and C. Batista, Phys. Rev. Lett. 108, 097202 (2012).

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