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Magnetic properties of organic-based Ni[TCNE](MeCN)$_2$][BF$_4$] magnet.[1] KONSTANTIN POKHODNYA, CNSE NDSU, Ohio Sate University, University of Utah, VICTOR DOKUKIN, JOEL S. MILLER, University of Utah — A new organic-based magnet of Ni[TCNE][BF$_4$](MeCN)$_{2-\delta}$ (**1**) composition (δ = 0.15; TCNE = tetracyanoethylene) was synthesized via reaction of NBu$_4$(TCNE) and Ni(NCMe)$_6$(BF$_4$)$_2$ in CH_2Cl_2. Zero field cooled and field cooled magnetizations, $M(T)_{ZFC}$ and $M(T)_{FC}$, at 0.5 mT rise sharply below 70 K indicative of an onset of a magnetic transition. $M(T)_{ZFC}$ reaches maximum at 25 K followed by a rapid decrease suggesting antiferromagnetic (AF) interaction. In contrast, $M(T)_{FC}$ rises upon further cooling signifying a strong irreversibility in accord with sharp increase of a remanant magnetization below 30 K and hysteretic behavior of $M(H)$. The $M(H)$ at 2 K increases rapidly with field and approaches saturation above $\sim$ 0.5 T. At 9 T $M(H)$ reaches 2.24 μ_B that is significantly higher than 1.30 μ_B expected for AF coupled Ni(II) S = 1 and [TCNE]$^-$ (S = 1/2) suggesting a ferromagnetic (FM) interaction. The unpaired Ni^{II} spins and those on the [TCNE]$^-$ reside in orthogonal orbitals resulting in FM coupling. Assuming that similarly to Fe[TCNE][FeCl$_4$](MeCN)$_2$ **1** consists of Ni^{II} – μ_4-[TCNE]$^-$ layers we believe that the decrease of $M(T)_{ZFC}$ below 25 K is due to AF coupling *between the layers* while the interaction *within the layer* is FM in contrast to the AF one reported for Fe, V, and Mn analogues.

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