Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Vanadium [ethyl tricyanoethylene carboxylate]$_x$: a new organic-based magnet

Yu Lu, Howard Yu, Megan Harberts, Arthur J. Epstein* and Ezekiel Johnston-Halperin*

Department of Chemistry and Department of Physics, The Ohio State University, Columbus, Ohio, 43210, United States

Cyclic voltammetry (CV) experiments are carried out by Reference 600 potentiostat (Gamry Instruments, Warminster, PA) in a custom made three-electrode electrochemical cell, with Pt as working electrode and counter electrode and Ag$_/$AgNO$_3$ in MCN (0.1M) as the reference electrode. Tetraethylammonium perchlorate (TEAP) is used as electrolyte and the scan rate is 50 mV/s. The observed are reduction potentials (vs.SCE) for TCNE, MeTCEC and ETCEC are 0.26, 0.02 and -0.05 eV respectively.

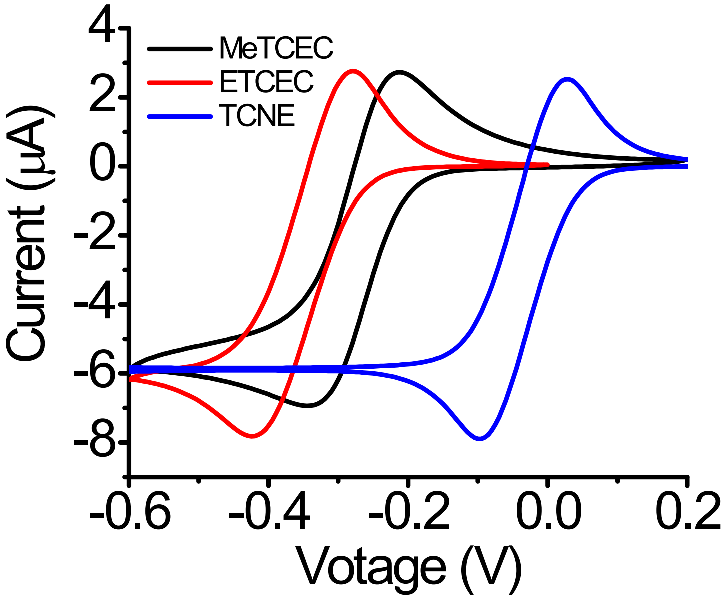

Figure S1. Cyclic voltammetry of tetracyanoethylene (TCNE), MeTCEC and ETCEC (1 mM) in Dichloromethane.

The ^{1}HNMR and ^{13}CNMR (Figure S2) are measured on the 400 MHz Bruker AVANCE III Spectrometer. All the peaks (see main test) are the same as reported in the literature. There is no peaks from Tetracyanoethylene (TCNE) found on the ^{13}CNMR spectrometer, suggesting the ethyl tricyanoethylene carboxylate (ETCEC) is pure without contamination from reactant TCNE.

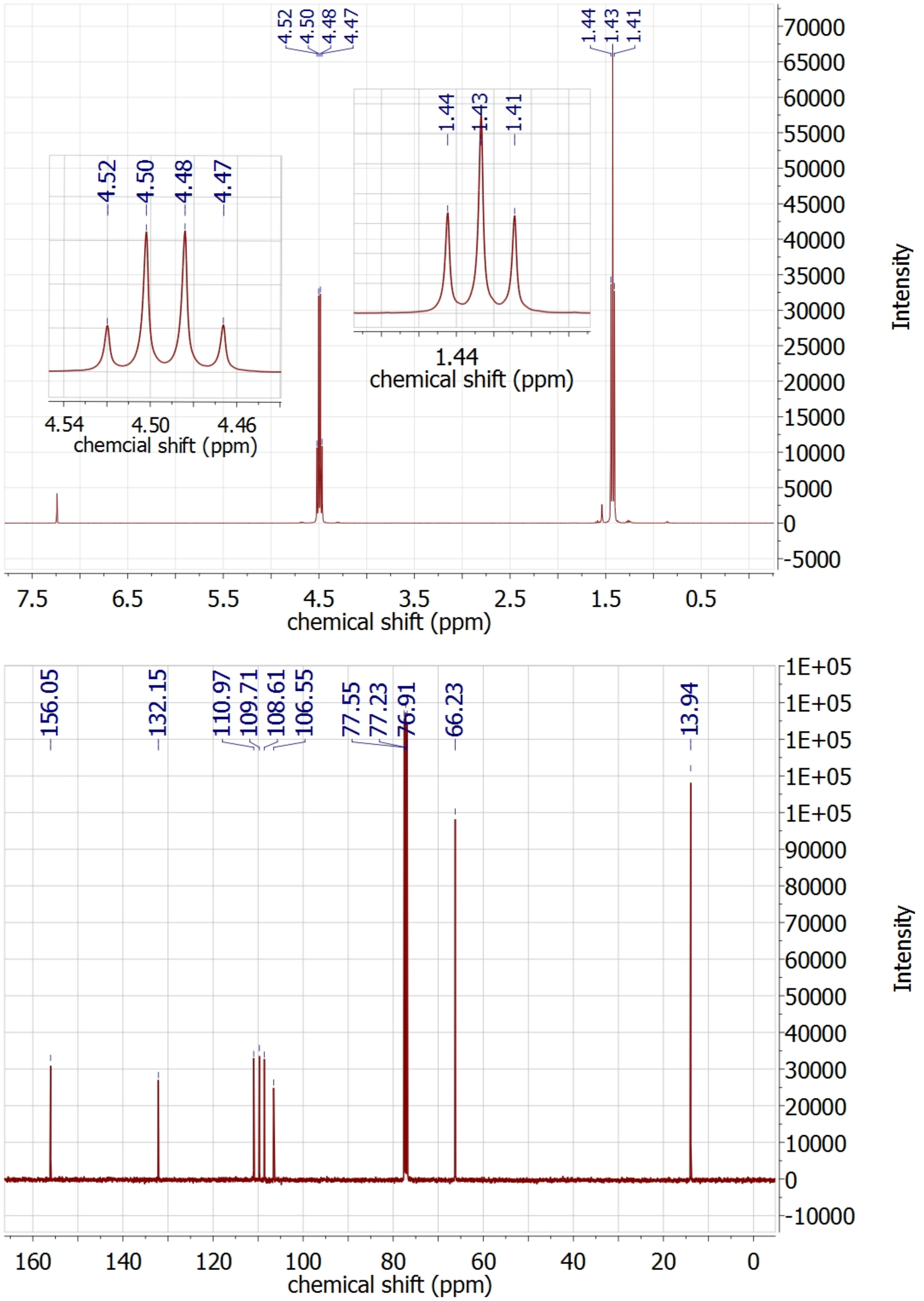

Figure S2. ^{1}HNMR and ^{13}CNMR of ethyl tricyanoethylene carboxylate (ETCEC).

Temperature dependence of zero-field-cooled (ZFC) and field-cooled (FC) magnetization of V[ETCEC]$_x$ are measured on SQUID at different external fields (Figure S3). With the decreasing temperature, both ZFC and FC curves rise and become irreversible at bifurcated temperature T_b. As further decreasing of temperature, both curves reach a maximum at a characteristic freezing temperature T_f. After that, ZFC and FC curves decrease as temperature decrease. It is noticed that the bifurcated temperature T_b shift to lower temperature with increased external field and disappear at high external field. While the freezing T_f remains almost the same with increasing external field at ~20 K.

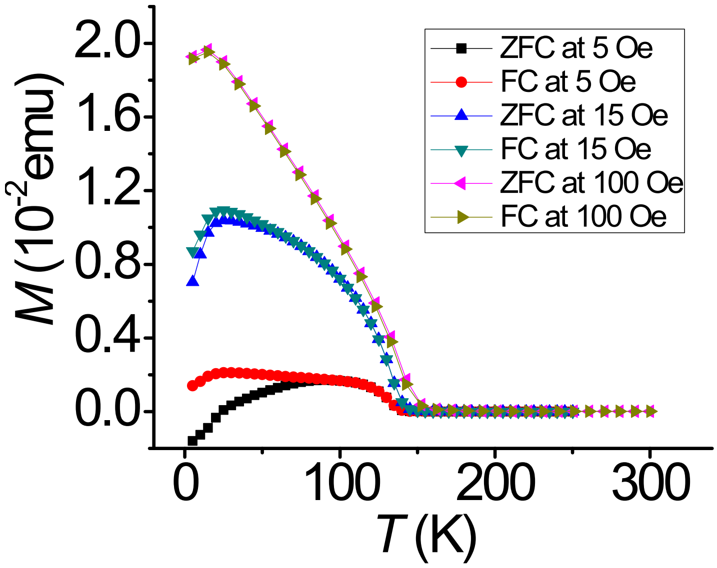

Figure S3. Temperature dependence of zero-field-cooled and field-cooled magnetization of V[ETCEC]$_x$ at a 5 Oe, 15 Oe, 100 Oe external field