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Realization of Long-Term Air Stability in the Organic Magnet Vanadium Tetracyanoethylene[1] IAN FRONING, MEGAN HARBERTS, YU LU, HOWARD YU, ARTHUR J. EPSTEIN, EZEKIEL JOHNSTON-HALPERIN, Ohio State Univ - Columbus — The organic ferrimagnet vanadium tetracyanoethylene (V[TCNE]x) has potential uses in both microwave electronics and spintronics due to the combination of high temperature magnetic ordering (TC >600 K), extremely sharp ferromagnetic resonance (peak to peak linewidth of 1 G), and low-temperature conformal deposition via chemical vapor deposition (CVD; deposition temperature of 50 C), but air-sensitivity leads to the complete degradation of the films within 2 hours under ambient conditions. We have encapsulated thin films of V[TCNE]x using a UV-cured epoxy that increases film lifetime to over 700 hours as measured by the remanent magnetization. The saturation magnetization and Curie temperature decay more slowly than the remanence, and the coercivity is unchanged after 340 hours of air exposure. Fourier transform infrared spectroscopy (FTIR) shows that the epoxy does not react with the film, and magnetometry measurements show that the epoxy does not impact bulk magnetic properties. This encapsulation strategy enables experimental protocols and investigations that were not previously possible for air-sensitive samples and points the way toward the development of practical applications for this promising organic-based magnetic material.

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