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Correlating Magnetotransport and Diamagnetism of sp2-Bonded Carbon Networks Through the Metal-Insulator Transition P.M. VORA, J.M. KIKKAWA, Department of Physics and Astronomy, University of Pennsylvania, P. GOPU, M. ROSARIO-CANALES, J.J. SANTIAGO-AVILES, Department of Electrical Engineering, University of Pennsylvania, C.R. PEREZ, Y. GOGOTSI, Department of Materials Science and Engineering, Drexel University — Titanium carbide-derived carbons (TiC-CDCs) are porous sp2-bonded networks synthesized by exposing TiC to chlorine gas at an elevated temperature. The latter "chlorination temperature" adjusts the size of graphitic domains within this material. We perform magnetoresistance, temperature dependent resistance, and SQUID magnetization measurements on TiC-CDC samples prepared at different chlorination temperatures. Transport reveals a metal-insulator transition where high (low) chlorination temperature samples are on the metallic (insulating) side of the transition. Magnetoresistance measurements are consistent with electronic transport in the weak and strong localization regimes for metallic and insulating samples, respectively. The diamagnetic contribution to the total magnetization increases with chlorination temperature, suggesting that the metal-insulator transition is associated with the expansion of graphitic domains. We also discuss a magnetoresistance anomaly observed in insulating samples. This work supported by NSF DMR-0907266 and NSF MRSEC DMR-05-20020.

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