

Abstract Submitted  
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**Magnetic studies of multi-walled carbon nanotube mats: Ultra-high temperature ferromagnetism or superconductivity?**<sup>1</sup> PIEDER BEELI, GUO-MENG ZHAO, Department of Physics and Astronomy, California State University, Los Angeles — We report magnetic measurements up to 1200 K on multi-walled carbon nanotube mats using a Quantum Design vibrating sample magnetometer. Extensive magnetic data consistently show two ferromagnetic-like transitions at about 1000 K and 1275 K, respectively. The lower transition at about 1000 K is associated with an Fe impurity and its saturation magnetization is in quantitative agreement with the Fe concentration measured from an inductively coupled plasma mass spectrometer. On the other hand, the saturation magnetization for the higher transition phase corresponds to about 0.6% Co impurity concentration, which is about four orders of magnitude larger than that measured from the mass spectrometer. We show that this transition at about 1275 K is not consistent with ferromagnetism of any carbon-based phases or magnetic impurities but with the paramagnetic Meissner effect due to the existence of  $\pi$  Josephson junctions in a granular superconductor.

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Guo-meng Zhao  
Department of Physics and Astronomy, California State University, Los Angeles

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