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1D goes 2D: A Kosterlitz Thouless transition in superconducting arrays of 4-Angstrom carbon nanotubes ZHE WANG, WU SHI, HANG XIE, TING ZHANG, NING WANG, ZIKANG TANG, XIXIANG ZHANG, ROLF LORTZ, PING SHENG, The Hong Kong University of Science and Technology — We report superconducting resistive transition characteristics for array(s) of coupled 4-Angstrom single wall carbon nanotubes embedded in aluminophosphate-five (AFI) zeolite. The transition was observed to initiate at 15K with a slow resistance decrease switching to a sharp, order of magnitude drop between 7.5-6.0K with strong (anisotropic) magnetic field dependence. Both the sharp resistance drop and its attendant nonlinear IV characteristics are consistent with the manifestations of a Kosterlitz-Thouless (KT) transition that establishes quasi long range order in the plane transverse to the c-axis of the nanotubes, leading to an inhomogeneous system comprising 3D superconducting regions connected by weak links. Global coherence is established at below 5K with the appearance of a well-defined supercurrent gap at 2K.

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