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Enhanced Tc in MgB_2 by SWCNT Dilution[1] DANHAO MA, The Pennsylvania State University, RUWANTHA JAYASINHA, University of Louisville, KOFI ADU, The Pennsylvania State University, Altoona College, GAMINI SUMANASEKERA, University of Louisville — We report for the first time a nonsubstitutional hole-doping of the MgB_2 structure and an increase in Tc by SWCNT dilution. The SWCNT concentration was varied from 0.05wt% to 5wt%. We investigated the temperature dependence resistivity from 10K to 300K of sintered MgB_2 powder containing dilute amount of ultra-high purity single wall carbon nanotubes. Micro-Raman spectroscopy, field emission scanning electron microscope and x-ray diffraction were used to analyze the interfacial interactions between the carbon nanotubes and the magnesium diboride grains. We obtained an increase in Tc from 41.1K to 45.8K. This is attributed charge transfer: electron transfer from the MgB_2 structure to the SWCNT structure. This consequently leads to hole-doping of the MgB_2 structure and the enhancement we see in Tc. This is confirmed by micro-Raman analysis of the phonon states of the SWCNT in the composites. This is explained in terms of the interplay between impurity scattering and hole-doping. This report provides experimental alternative pathway to hole-doping of MgB_2 without appealing to elemental substitution.

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