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Hopping Conduction in Individual Template-Produced Multiwalled Carbon Nanotubes D. P. WANG, B. R. PERKINS, A. J. YIN, D. E. FELDMAN, A. ZASLVASKY, J. M. XU, Department of Physics and Division of Engineering, Brown University — We report electrical transport measurements of individual multiwalled carbon nanotubes grown catalytically in a nonporous anodic aluminum oxide template by thermal chemical vapor deposition of acetylene. The conductance shows an exp[-$(T_0/T)^{1/2}$] dependence on temperature T and exp[-ξ_0/ξ] dependence on the applied electric field ξ in the high field regime, suggesting that hopping conduction between the grains is the dominant transportation mechanism. As the nanotubes are granular and highly defective, annealing has been used to change the granularity. Similar T- and ξ- dependence of conductance is observed for annealed nanotubes with different granularity-related coefficients $T_0$and ξ_0. Small magnetoresistance is observed for both types of nanotubes. Comparison with theory is presented and the $T_0$and ξ_0 coefficients are used to extract the characteristic conducting grain size.

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