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Modeling Superconducting properties of an inhomogeneous mixture of doped metallic and semiconductor carbon nanotubes ILYA GRIGORENKO, Penn State University, ANVAR ZAKHIDOV, The University of Texas at Dallas — We considered theoretically the superconducting properties of a bundle of boron-doped carbon nanotubes, which consists of two types of nanotubes: semiconducting and metallic. The tubes are assumed to be close-packed, making a hexagonal lattice in the transverse section of the bundle. The properly doped semiconducting nanotubes are assumed to have a higher transition temperature than metallic because of the lower lying Van Hove singularities in the DOS (proven in experimentally found Kataura plot). We used an inhomogeneous microscopic model to describe the proximity effects between the two different types of tubes, and calculated the averaged superconducting critical temperature for the bundle given a ratio between the metallic and semiconductor nanotubes. We found that the critical temperature scales approximately quadratically as a function of the ratio. We also discuss briefly the possible effect of metallic nanotubes on the suppression of the phase fluctuations in 1-D superconducting pairing in properly doped semiconducting nanotubes.

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