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Diameter and chirality dependence of exciton properties in carbon nanotubes RODRIGO CAPAZ, Instituto de Fisica, UFRJ, Brazil, CATALIN SPATARU, U. C. Berkeley, SOHRAB ISMAIL-BEIGI, Yale University, STEVEN LOUIE, U. C. Berkeley — We calculate the binding energies and sizes of excitons in carbon nanotubes using a symmetry-based, effective-mass, variational method. This approach provides exciton binding energies in good agreement with available first-principles results and its simplicity allows calculations for a variety of diameters (d) and chiralities. The exciton binding energies present an overall decrease with $1/d$, with strong chirality dependence and family behavior. The exciton sizes scale with d, also showing family behavior. We also address the important issue of bright-dark exciton splittings, which are found to decrease as $1/d^2$. Dependence of these properties on the dielectric screening will also be addressed, in the light of recent experimental measurements. This work was supported in part by the NSF under Grant No. DMR04-39768, and the U.S. DOE under Contract No. DE-AC03-76SF00098.

Rodrigo Capaz
Instituto de Fisica - UFRJ

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