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Optical Properties of Aligned Carbon Nanotube Mats for Photonic Applications G.L. ZHAO, Southern University and A&M College; Visiting Fellow, Princeton University, D. BAGAYOKO, Southern University and A&M College, L. YANG, NASA Ames Research Center — We studied the optical properties of the aligned carbon nanotube (16, 0), (10, 0) and (8, 4) mats for photonic device applications. We employed the ab-initio density functional calculations in the linear combination of atomic orbital formalism. We calculated the electronic structure of the carbon nanotube mats and the real and imaginary parts of the dielectric functions as functions of photon energy. The calculated dielectric functions of the aligned carbon nanotube mats show a strong anisotropy when the electric field of light is parallel or perpendicular to the tube axes. Especially, there are strong peaks in the imaginary part of the dielectric function near the absorption edges, when the electric field of light is parallel to the carbon nanotube axes. The unusual optical properties of the semiconducting carbon nanotube mats present a new opportunity for applications in new electro-optical devices in the infrared energy region. Acknowledgments: this work was funded in part by NSF (Award No. 0508245), NASA (Award No. NCC 2-1344), and ONR (Grant No: N00014-05-1-0009).

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