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Polarization dependence of the optical absorption of single-walled carbon nanotubes YOICHI MURAKAMI, ERIK EINARSSON, TADAO EDAMURA, SHIGEO MARUYAMA, The University of Tokyo — Anisotropic optical absorption properties of single-walled carbon nanotubes (SWNTs) are determined from the measurements of a recently developed vertically aligned SWNT film grown on an optically polished quartz substrate. In addition to the inter-subband absorption below 3 eV, we present the remarkable polarization dependences of absorption peaks at 4.5 eV and 5.25 eV. Origins of these absorption peaks are clarified and their important relevance to the optical properties of graphite is revealed. A method of determining a nematic order parameter of the vertically aligned SWNT film by separating the collinear absorption peak at 4.5 eV from other transition dipoles is introduced. Subsequently, the intrinsic optical absorption cross-sections of the SWNTs for 0.5 - 6 eV are determined for both parallel and cross-polarized light. It is shown that the tail of the non-collinear absorption peak at 5.25 eV contributes appreciably to the absorption of cross-polarized light even in the inter-subband transition region below 3 eV.

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