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Origins of optical absorption components of metallic and semiconducting single-wall carbon nanotubes in ultra-violet region KAZUHIRO YANAGI, TAKESHI SAITO, YASUMITSU MIYATA, HIROMICHI KATAURA, Natl. Inst. Adv. Indust/Sci. Tech. — There are large absorption components in the optical absorption spectra of single-wall carbon nanotubes (SWCNTs) in the ultraviolet (UV) region ($\sim$5 eV). Clarification of the origins of the UV absorption is important, since the tails of the UV components influence the transparency of nanotubes and impede their uses for transparent conducting films. However, the origins have not been correctly understood yet. Such UV absorption components are assumed to be caused by π-plasmons, however, recently contributions from $\pi - \pi^*$ transition at the M point were also suggested. To understand the origins of UV component, here we clarified how the electronic structure (metallic or semiconducting) and the diameters of SWCNTs influence the UV optical absorption features. We clearly identified two components in UV region, and revealed dependence of the components on their diameters. Remarkably, dependence of the peak-energies of one component on diameters could not be explained by plasmon model, implying the presence of different origins than plasmons in the UV absorption components.

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