# Near-infrared magneto-optical study of excitonic states in single-walled carbon nanotubes under ultra-high magnetic fields

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| **Abstract** | Singlet excitonic states at the first subband-edge in single-walled carbon nanotubes (SWCNTs) have been studied through near-infrared magneto-absorption spectroscopy under magnetic fields to 105.9 T. Well-resolved absorption spectra of stretch-aligned SWCNT(CoMoCAT)-gelatin films were obtained above 100 T. By the application of magnetic fields in parallel to the alignment of SWCNTs, peak shift toward the lower energy was observed for (8, 4) and (7, 6) tubes and the opposite behavior was observed for (7, 5) and (6, 5) tubes. Above 28.8 T, new peaks emerged at the higher energy side of the peak for the (8, 4) and (7, 6) tubes, and at the lower energy side of the peaks for the (7, 5) and (6, 5) tubes. The magnetic splitting between the existing peak and the new peak was symmetric for every tube, which is in line with the energy splitting due to the Aharonov-Bohm effect. Judging from the energetic positions where the new peaks emerged, the singlet dark excitonic state locates at the lower energy than the singlet bright one in the (7, 5) and (6, 5) tubes while it is suggested strongly that the bright one locates at the lower energy in the (8, 4) and (7, 6) tubes. |
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