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Hall Effect and Magnetoresistance of Single-walled Carbon Nanotubes S. H. JHANG, S. H. LEE, U. DETTLAFF, D. S. LEE, S. ROTH, Y. W. PARK, C. STRUNK, Institute of Experimental and Applied Physics, University of Regensburg — We report Hall coefficient and magnetoresistance measurements on films and networks of single-walled carbon nanotubes (SWNTs). Four different types of SWNTs are prepared as films; Purified SWNTs synthesized either by HiPCO (High-Pressure CO Conversion) process or by laser ablation method (laser SWNTs), and HiPCO and laser SWNTs chemically treated by $SOCl_2$. $SOCl_2$-modified SWNTs show higher conductivity due to doping effect. The measured Hall voltages are linear for all samples in fields up to 6 T. The carrier density of SWNTs is determined to be $\sim 10^{22}$ cm^{-3} for HiPCO and $SOCl_2$-modified SWNTs, and $\sim 10^{21}$ $cm^{-3}$for laser SWNTs. Considering that theoretically predicted carrier density of metallic SWNT is $\sim 10^{22}$ cm^{-3} and that of semiconducting SWNT is $\sim 10^{20}$ cm^{-3}, the difference in carrier density between HiPCO and laser SWNTs can be originated from the difference in the ratio of metallic and semiconducting SWNTs in both films. While Hall coefficient is positive in the whole temperature range of 1.4 - 300 K for HiPCO and $SOCl_2$-modified SWNTs, the Hall coefficient of laser SWNTs interestingly shows a sign change around at T = 15 K. The magnetoresistance of SWNTs studied in high magnetic fields up to 33 T, and in a temperature range of 0.4 - 300 K will be also presented.

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