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Magneto-resistance of multiwall carbon nanotube Fermat yarn and coil yarn[1] KIEU TRUONG, HAEYONG KANG, YOURACK LEE, JOONGGYU KIM, YOUNG HEE LEE, DONGSEOK SUH, Sungkyunkwan Univ, IBS CENTER FOR INTEGRATED NANOSTRUCTURE PHYSICS, INSTITUTE FOR BASIC SCIENCE (IBS), SKKU, KOREA COLLABORATION, DEPARTMENT OF ENERGY SCIENCE, SUNGKYUNKWAN UNIVERSITY, SUWON 440-746, KOREA COLLABORATION, DEPARTMENT OF PHYSICS, SUNGKYUNKWAN UNIVERSITY, SUWON 440-746, KOREA COLLABORATION — Multiwall carbon nanotube (MWCNT) based yarn has attracted a great attention for the development of multifunctional super-fiber due to its light weight, high flexibility, high conductivity, and strong mechanical properties (Lima et al. 2011, Science). Recently the importance of coiled yarn structure was demonstrated for practical applications (Haines et al. 2014, Science). In this study, we measured the electrical resistance of neat yarns and coiled yarns at different temperatures and magnetic fields. The coiled yarn was formed by twist-insertion into the neat yarn, and the transverse and longitudinal magnetoresistance (MR) measurements were carried out. The logarithmic temperature dependence of normalized resistance and the negative MR can be explained by the combined contribution of weak-localization effect and the tunneling transport at different temperature ranges. The magnitude difference of MR between two configurations and the survival of such difference even at room temperature indicate that one-dimensional transport features are quite significant in this system. Developing Route for sub-micrometer-scale coil is discussed.

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