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Highly flexible, mechanically robust superconducting wire consisting of NbN-carbon-nanotube nanofibril composites JEONG-GYUN KIM, CINAP, IBS, DOES, Sungkyunkwan Univ, HAEYONG KANG, DOES, Sungkyunkwan Univ, JOONGGYU KIM, YOUNG HEE LEE, DONGSEOK SUH, CINAP, IBS, DOES, Sungkyunkwan Univ — A flexible superconducting fiber is prepared by twisting carbon nanotube (CNT) sheets coated with sputter-deposited niobium nitride (NbN) layer to form the shape of yarn. Twisted CNT yarn, which has been extensively studied due to its high flexibility as well as excellent mechanical properties, and NbN, which is a superconducting material with high transition temperature (Tc) and critical magnetic field (Hc), are combined together by the deposition of NbN layer on free-standing CNT-sheet substrate followed by the bis-crolling process. We tried many experimental conditions to investigate the superconducting properties of NbN-CNT yarn as a function of NbN thickness and number of CNT-sheet layers, and found out that the superconducting property of NbN on CNT-sheet can be comparable to that of NbN thin film on the normal solid substrate. In addition, the superconducting property survived even under the condition of severe mechanical deformation such as knotting. These results show the potential application of this technology as a large-scale fabrication method of flexible, mechanically robust, high performance superconducting wire. This work is supported by the Institute for Basic Science (IBS-R011-D1), and by the National Research Foundation (BSR-2013R1A1A1076063) funded by the Ministry of Science, ICT & Future Planning, Republic of Korea.

Jeong-Gyun Kim
CINAP, IBS, DOES, Sungkyunkwan Univ

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