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Tomonaga-Luttinger liquid related superconductivity in end-bonded carbon nanotubes JUNJI HARUYAMA, IZUMI TAKESUE, NAOKI KOBAYASHI, Aoyama Gakuin University, SHOHEI CHIASHI, SHIGEO MARUYAMA, Tokyo University, TOSHIKI SUGAI, HISANORI SHINOHARA, Nagoya University — Is it possible to find superconductivity in one-dimensional (1D) systems? It is well known that 1D systems have some obstructions that prevent emergence of superconductivity, e.g. Tomonaga-Luttinger liquid (TLL), spin fluctuation, van-Hove singularity, Peierls transition, and charge-density waves. Carbon nanotube (CN) is a good candidate to investigate this possibility. Although a variety of intriguing quantum phenomena has been reported in CNs, only two groups reported intrinsic superconductivity without reproducibility by other researchers. As well, the transition temperature (Tc) was as low as 0.2K in suspended ropes of SWNTs. Although Tc of 15K was found in thin SWNTs, it was identified only from the Meissner effect. No correlation with 1D phenomena, in particular with TLL arising from 1D electron-electron interaction, was also clarified. Here, we report superconductivity with the onset Tc as high as 12K and T=7.8K, at which resistance drops to zero ohm, for the highest case in end-bonded CNs, which were packed into nanopores of alumina templates. The transition temperatures were approximately 25-times and 40-times larger than those in a past report, respectively. We find that end-bonding the CNs by an electrode is the crucial factor for realizing superconductivity that overcomes TLL.

Junji Haruyama
Aoyama Gakuin University

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