

Abstract Submitted  
for the MAR05 Meeting of  
The American Physical Society

Sorting Category: 07.4 (E)

**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 ( $T_c$ ) was as low as 0.2K in suspended ropes of SWNTs. Although  $T_c$  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  $T_c$  as high as 12K and  $T=7.8$ K, 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.

Prefer Oral Session  
 Prefer Poster Session

Junji Haruyama  
J-haru@ee.aoyama.ac.jp  
Aoyama Gakuin University

Date submitted: 30 Nov 2004

Electronic form version 1.4