Recent progress of study of carbon-nanotube superconductivity

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Abstract: Superconductivity (SC) in carbon nanotubes (CNTs) is quite interesting issue from many standpoints; e.g., 1. From physics of one-dimensional (1D) SC, 2.from electron correlation in 1D conductors, 3. as recently found carbon-related new-superconductor family (CaC_6 and boron-doped diamond), and 4. From possibility of high-T_c SC (~40K). We reported SC in arrays of multi-walled CNTs (MWNTs) for resistance drop with the highest T_c = 12K [1] and its correlation with contact structures between metal electrode and MWNTs. After then, based on the report, many theories for the CNT-SC have been proposed and are attracting considerable attention; e.g., 1.Carrier doping effect in MWNTs and phase transitions [2], 3.Carrier doping effect in (10,10) single-walled CNTs [3], and 4. Correlation between SC and edge state [4].

Here, we have had progress in the experiments after reporting ref.[1]. In the talk, I will introduce recent some experimental results of the MWNT-SC; i.e., 1. Meissner effect with T_c = ~20K in the honey comb array structure of alumina template [5], 2. Interplay between SC and Tomonaga-Luttinger liquid states in partially end-bonded MWNTs [6], 3. Confirmation of presence of boron in the MWNTs by NMR [6]. Moreover, I will briefly talk about Meissner effect found in sheets of boron-doped single-walled CNTs synthesized in controlled doping manner [7].

SC in CNTs is promising. Realizing higher T_c is highly expected.

References

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