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Comparative study of gel-based separated arcdischarge, HiPCO, and CoMoCAT carbon nanotubes for macroelectronic applications HUI GUI, JIALU ZHANG, BILU LIU, JIA LIU, CHONGWU ZHOU, University of Southern California — Due to their excellent electrical properties and compatibility with room-temperature deposition/printing processing, single-walled semiconducting carbon nanotubes (SWNTs) hold great potential for macroelectronic applications. However, the relative advantages and disadvantages of various SWNTs for macroelectronics remains an open issue, despite the great significance. Here we report a systematic study of three kinds of mainstream SWNTs (arc-discharge, HiPCO, CoMoCAT) separated using gel-based column chromatography for thin-film transistor applications, and high performance transistors—which satisfy the requirements for transistors used in active matrix organic light-emitting diode displays—have been achieved. We observe a trade-off between transistor mobility and on/off ratio depending on the SWNT diameter. While arc-discharge SWNTs with larger diameters lead to high device mobility, HiPCO and CoMoCAT SWNTs with smaller diameters can provide high on/off ratios ($>10^6$). Furthermore, we compare gel-based separated SWNTs with SWNTs separated by the density gradient ultracentrifuge (DGU) method, and find that gel-separated SWNTs can offer purity and thin-film transistor performance as good as DGU-separated SWNTs.

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