The Template Synthesis of Double Coaxial Carbon Nanotubes with Nitrogen-Doped and Boron-Doped Multiwalls

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Supporting information

Electrical resistance measurement. The electrical resistance of the carbon-coated AAO films (CNT/AAO composites) was measured by a two-terminal method as shown in Figure S1. All the nanotubes prepared by the template technique were embedded in the nanochannels of AAO templates and parallel to each other as a result. We performed oxygen plasma treatment (100 W, 2 min) for CNT/AAO to remove the carbon layers deposited on the outer surface of AAO template. We coated both sides of a plasma-treated CNT/AAO composite film with silver paste (Dotite 550, Fujikura Kasei), to which two silver wires are attached. A potential (-1.0 to 1.0 V) is applied to both surfaces of the film through the two conducting wires and the I-V characteristics were measured at a temperature of 25 °C. According to the I-V curves, the resistances were obtained and then the specific resistivity of the prepared CNTs was induced. For each case, five samples were measured to obtain the average resistance (R_m), after the error correction by subtracting the contact resistance of conducting wires and silver paste). The area (denoted as A) of each side of CNT-AAO film employed is about 0.5 cm^2, and the number (n) of nanotubes in an AAO template per unit area is estimated as $5\times10^{10}/cm^2$ according to the SEM observation. Apparently, the resistance (R) of an individual nanotube is determined from Rm, n and A by the equation: $R=nAR_m$. Then the specific resistivity (ρ) of CNT is calculated according to the equation: $\rho=RS/L$ (S, L: cross sectional area and length of an individual CNT, respectively).

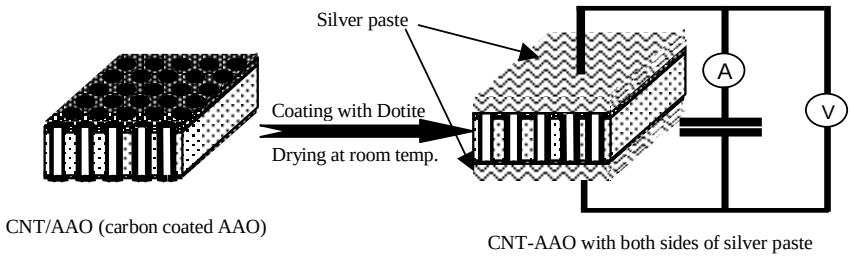

Figure S1. Schematic diagram of electrical conductance measurement of template-synthesized CNTs