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Covalently Functionalized Carbon Nanotubes for Electronics[1]
DELPHINE BOUILLY, JANIE CABANA, FRANÇOIS MEUNIER, FRANÇOIS LAPOINTE, FRANCIS L. LAROUCHE, MATTHIEU PAILLET, RICHARD MARTEL, Universite de Montreal, MAXIME DESJARDINS-CARRIÈRE, PHILIPPE GAGNON, ELYSE ADAM, Ecole Polytechnique de Montreal, REGROUPEMENT QUÉBÉCOIS SUR LES MATÉRIAUX DE POINTE (RQMP) TEAM — Covalent chemistry on carbon nanotubes generates useful and stable functionalities, but it also generally damages their electronic properties, which is a critical drawback for device applications. Here we present two approaches to achieve covalent functionalization of carbon nanotubes without compromising on their electronic properties. For each case, we demonstrate the fabrication of functional carbon nanotube devices. First, double-walled carbon nanotubes (DWNTs) are functionalized using a monovalent reaction with aryldiazonium salts. Absorption and Raman spectroscopy along with electrical measurements show that the functionalization occurs strictly on the outer wall and preserves the optical and transport properties of the inner wall. Functionalized-DWNT devices are operated with similar characteristics as pristine single-walled carbon nanotube (SWNT) devices [1]. Second, SWNTs are functionalized with different addends using a divalent carbene reaction. For both metallic and semiconducting species, electrical measurements of numerous functionalized and unfunctionalized SWNT devices show identical characteristics.
Ref: [1] Bouilly D. et al. ACS Nano, 5 (6), 4927 (2011)

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