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Electrical and Optical Properties of Covalently Functionalized Double-Walled Carbon Nanotubes DELPHINE BOUILLY, JANIE CABANA, FRANCOIS MEUNIER, Universite de Montreal, MAXIME DESJARDINS-CARRIERE, Ecole Polytechnique de Montreal, FRANCOIS LAPOINTE, FRANCIS L. LAROUCHE, Universite de Montreal, PHILIPPE GAGNON, ELYSE ADAM, Ecole Polytechnique de Montreal, MATTHIEU PAILLET, RICHARD MARTEL, Universite de Montreal, RQMP COLLABORATION — Double-walled carbon nanotubes (DWNT) present a particular geometry in which the inner wall is isolated by the outer wall, while the latter is in direct interaction with the environment. Here, we studied optical and electrical properties of functionalized DWNT derivatives (f-DWNT) prepared by aryldiazonium reactions. We first present absorption spectra of f-DWNT films and resonant Raman spectra of individual f-DWNT assembled in devices. The results show that functionalization reaction occurs only at the surface of the outer wall, leaving the properties of the inner wall intact. Second, electrical transport experiments performed on individual f-DWNT field-effect transistors revealed that the inner wall carry electrical current with a similar intensity as for a single-walled carbon nanotube. Finally, we demonstrate that simple electrical measurements combined with covalent functionalization are sufficient to determine the metallic or semiconductor character of both walls.

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