

Conduction anisotropy in carbon nanowall layers obtained by a low-pressure plasma jet

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Carbon nanowalls (CNW, vertical graphenes) consisting of inter-connected vertical carbon sheets built from small graphene domains with their c-axis parallel to the substrate are promising materials for new electrical devices. Nevertheless, their electrical properties are not sufficiently known [1]. In this study we studied the behavior of the load carriers in plasma deposited CNW. The carbon layers were grown by Plasma Enhanced Chemical Vapor Deposition by injecting H₂ and C₂H₂ (acetylene) in an Ar radiofrequency plasma jet [2]. SEM and Raman techniques were used to characterize the material.

A special electrical cell was designed, consisting of a three-layer sandwich built on silicon wafer, having as base a Pt electrode, in the middle the CNW layer, and on top, as upper electrode, a gold disc. The upper gold electrode was deposited by magnetron sputtering at angled incidence (30 degrees to vertical) thus preventing the deep penetration of the metal in the pores of the CNW layer, thus preventing the short-circuit with the Pt electrode. The I-V curves were measured directly between the Pt and Au, across the CNW layer, without and with a magnetic field applied parallel to the substrate (in plane with the c-axis of the sheets).

The measurements, revealed us the type of conduction and the mobility of carriers along, and perpendicular on the carbon sheets. The results indicated for CNW a semiconductor of p-type, whose conductivities parallel and perpendicular to the sheets planes are different.

Keywords: PECVD, Hall Effect, CNW.

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Not applicable.

Conflicts of Interest

The authors declare no conflict of interest.

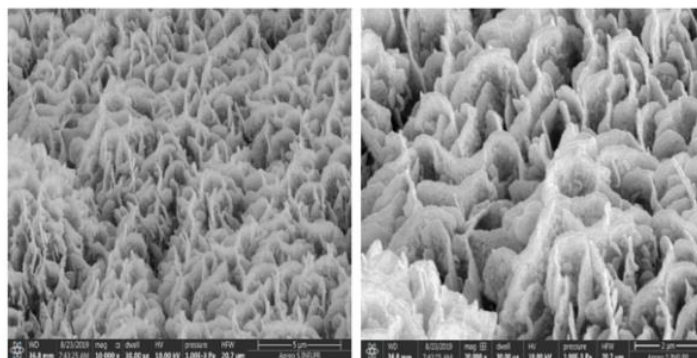


Figure 1. SEM image of CNW in cross section with gold sputtering deposition.

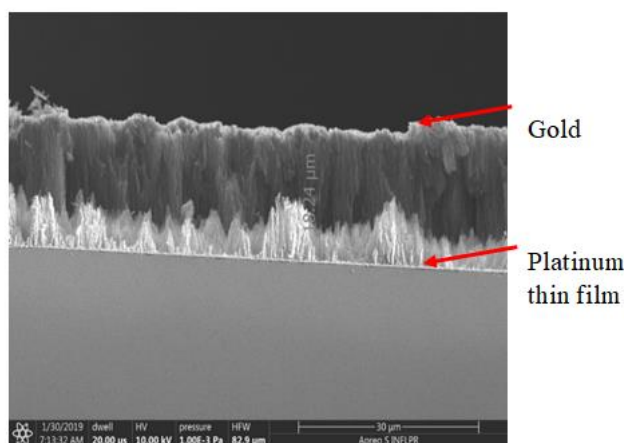


Figure 2. SEM image of CNW in cross section with gold sputtering deposition.

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