Carbon nanowalls functionalization for controlling the metallic nanoparticles attachment

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Carbon nanowalls, described as two-dimensional lamellar nanostructures assembled from few layers of graphene sheets, might be ideal hosts for supporting metallic nanoparticles because they have a large specific area related to their volume and present a nano-porous network. CNW decorated with metal nanoparticles can provide some of the most interesting nanocomposites materials, with applications in nano-sensors, catalysis and fuel cells. Important issues that need to be considered for development of nano-sensors are the attaching and integration of the nanoparticles on/in the nanostructures walls, their homogeneous dispersion/distribution, and their size. In general, the particle attachment to surfaces under controlled conditions is difficult. Promising results are obtained in case of functionalization (using for example plasma) of the nanostructured architecture support prior to the nanoparticles attaching.

The present contribution focuses on the CNW plasma functionalization processing for the promotion and control of nanoparticles attachment by activation and incorporation of functional groups. The functionalization with metal nanoparticles was achieved by sputtering of metal targets (Ni, Pt, Ag) using the magnetron technique implemented in the same deposition chamber in which the CNWs are synthesized. Magnetron sputtering deposition of metallic nanoparticles was done for different exposure times, on as –synthesized and plasma treated CNWs in hydrogen, oxygen and ammonia gases. The characteristics of the obtained nanoparticles/CNW materials were investigated by SEM, AFM, XRD, TEM, Raman Spectroscopy techniques.