Co-DOPED MANGANITE/GRAPHENE AS NEW PROTOTYPE FOR MAGNETIC FIELD SENSOR APPLICATION

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Co-doped $La_{1-x}Sr_xMn_yO_3$ manganite with single or few layer graphene is a novel system designed for magnetic sensor application at room temperature. Manganite/graphene structure combines the properties of manganite with negative magnetoresistance (MR) and two-dimensional graphene with positive MR in order to increase the sensitivity of sensor based on magnetoresistence also in the presence of low magnetic field, in the range 0.1-21 T.

The properties of Co-doped $La_{1-x}Sr_xMn_yO_3$ with single layer graphene SLG, three-layer 3LG or five layer 5LG, were characterized by using X-ray photoemission spectroscopy (XPS) and Auger electron spectroscopy (XAES). XPS studies were focused on the analysis of photoemission C1s spectra of graphene layer, whereas the Auger spectra of C KVV region were used for determination of the D parameter [1].

Because this prototype of new device was prepared by exfoliating commercial high-quality monolayer graphene on Cu previously passivated with polymethylmethacrylate PMMA, from the component analysis of C1s spectra was possible to identify also the presence of polymer residues which could negatively affect the sensitivity to the magnetic field.

Magnetoresistance measurements of the sensors assembled with single and few layer graphene in permanent and pulsed magnetic fields have shown that the best sensitivity response is obtained for 3LG samples. This result was in accordance with XPS and XAES data, which revealed a better quality of 3L graphene with lower content of residues due to exfoliation process.

[1] S. Kaciulis, A. Mezzi, P.Calvani, D.M. Trucchi, Electron spectroscopy of the main allotropes of carbon. Surf. Interface Anal. 46 (2014) 966-969.