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Properties and application of doped-SWCNT, doped-CSCNT, and free-standing reduced graphene oxide sheets for energy devices

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Graphene and Carbon Nanotubes (CNTs) are nanomaterials extensively studied for energy applications, mainly as additives in composite electrodes to promote electric and thermal conductivity, reinforce the mechanical strength, and enhance the flexibility. Also, introduction of these materials into the semiconductors electrodes can reduce the resistance of the active materials and produce a composite nanomaterial, due to the interactions between carbon nanostructures and other nanomaterials or substrates. Therefore, our studies are concentrated on Carbon Nanostructures modified by doping during synthesis and in production of graphene to development of energy devices. Nanocomposites with cup-stacked carbon nanotubes (CSCNT) and free-standing reduced graphene oxide sheets (RGO) are studied for third-generation electrochemical glucose biosensors to promote direct electronic communication between glucose oxidase and electrode. The use of graphene-based materials are a promising approach to mediate electron transfer between the enzyme and the electrode due to graphene can electrochemically distinguish between species with close redox potentials. This new investigative strategy should help to modulate the electronic properties of RGO. Another approach is the use of Doped-SWCNT and CSCNT for Dye-sensitized solar cells (DSSC) due to the unique properties of these both CNT, including high wettability that promotes better interaction between CNT and TiO_2 paste. However, it is not clear yet why the addition of CNT outside the concentration range 0.3 to 0.1 wt% has negative effects on the efficiency of DSSC, even if photoanode remains transparent. Thus, the photovoltaic properties were characterized by photocurrent-voltage (J-V) curves under illumination and UV-Vis spectroscopy was conducted in order to elucidate how the incorporation of CNTs affects the transmittance of light as function of concentrations.

Biography

Elaine Y Matsubara has completed his PhD from Universidade de Sao Paulo (Brasil), and postdoctoral studies at Instituto de Ciencias de Los Materiales de Madrid (Spain), Energia Nucleare e Delle Energia Alternative - ENEA (Italy), and Università La Sapienza (Italy). She is researcher at Universidade Estadual Paulista – UNESP (Brasil) and concentrates her studies in the synthesis of doped carbon nanotubes and exfoliated graphene production to application and development of ion lithium batteries, sensors and solar cells.

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