Silver nanoparticles/conjugated polymer nanocomposites

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Spin-coated films of PVA/AgNO3 were deposited on polystyrene films and submitted to a thermal treatment at 130°C to produce in situ Ag nanoparticles hosted in polymeric matrix[1]. MEHPPV [poly(2,5methoxyethylexyloxy-(1,4-phenylenevinylene))] and poly(2-thienylene-2,5-dialkoxyphenylene)[2] were also used as host/active polymeric matrix in order to study optical properties of these systems. Previous studies [3] have shown that these composites present applicability in photonic devices, such as wave guides and optical limiters. This is due to charge transfer process from conjugated polymers to metallic nanoparticles, besides their linear and non-linear optical properties. Metallic nanoparticles can also play a role as photoluminescence enhancer in polymeric solar cells, acting as an exciton dissociation center by built-in interface potential and a hole injector, increasing quantum yield. Optical analyzes, such as optical absorption, photoluminescence and Raman Spectroscopy were carried out so that transfer mechanisms can be monitored in function of Ag nanoparticles concentration. Conductivity was studied by I x V and I x t measurements on tin oxide fluorine-doped (FTO) substrates. The linear absorption bands of the dopant (Ag nanoparticles) and polymeric matrix overlap, what provides, when pumped with light at a frequency within the band, a very large nonlinear optical coefficient under resonant conditions[3]. Moreover, the interelectron transfer process between metal nanoparticles and polymer molecules ensures a very rapid response (approx 10^{-12}s). These measurements show electronic changes caused by dopant character of silver nanoparticles and the possible consequences of this process over applicability of the materials on organic devices.

Keywords: organic light emitting devices, photovoltaics, conjugated polymers, gamma radiation.

Work supported by CNPq, CAPES, FAPEMIG, INEEL, INCT – Rede Nacional de Pesquisa em Nanotubos de Carbono

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