

Optical Properties of Polymer/Metal Nanocomposites and Application as Smart Materials

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Since the born of nanotechnology it was evident that the optical properties of nanostructured metal particles strongly depend on their dimensions and shape. In particular, noble metal nanoparticles or semiconducting nanocrystals embedded in bulk polymer matrices show enhanced optical and magnetic properties due to the stabilizing effects to size and aggregation provided by the macromolecular support. For example, clusters of noble metals, such as gold, silver or copper, assume a real and natural colour due to the absorption of visible light at the surface plasmon resonance frequency. The application of composites containing noble metal nanoparticles strictly depends on the ability to control and to modulate their size, shape and aggregation extent. In the last years a lot of efforts were focused in our laboratory on the preparation of metal “nanodispersion” in the polymer matrix by mixing the components in solution or by a one-step method based on the thermally- or UV-induced reduction of the inorganic precursor through a solid state synthesis.^[1-3]

All the nanocomposites containing moderate amounts of the nanostructured filler (from 0.5 to 4% by weight) showed modulable optical properties, which are responsive to the local environment due to the interactions between stabilizing layers and polymeric matrices. Thus these hybrid materials can be regarded as very important for future advanced applications including the possibility of inducing nanophase organization through external stimuli.

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