Preparation and Photochromic Behavior Study of Ormosil-Polyoxometalate Hybrid films doped with ZnO Nanoparticles

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Ormosil (organically modified silicates) are class II hybrid organic-inorganic materials which offer a wide range of applications on account of their versatility, kinetic and thermodynamic stabilities. Due to the friendly conditions used in their synthesis and to their porosity, they can be used as matrices to trap enzymes, drugs, catalysts, or photocromic compounds.[1] In this work, ormosil prepared by the sol-gel route are used to form films (by dip-coating) containing 12-phosphotugstic acid ($H_3PW_{12}O_{40}$), a Keggin type heteropolyoxometalate[2] that exhibits photochromic properties. The aim of this work is to study the effect of the addition of ZnO semiconductor nanoparticles in the photochromism of these materials. The evaluation of the photochromic properties was made by the irradiation with a solar light simulator and monitoring by electronic spectroscopy in the visible region.

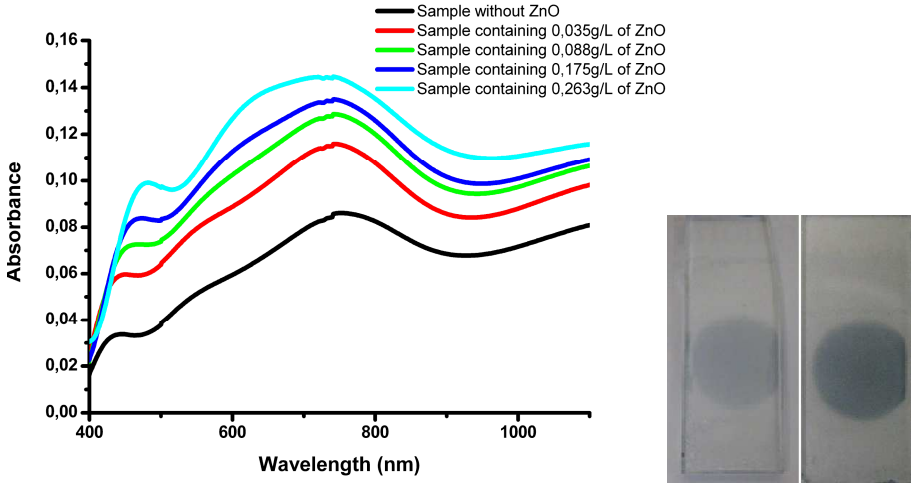

Figure 1. Electronic spectra and photos of ormosil-phosphotungstate regular sample and ZnO nanoparticles doped samples after been irradiated with 100 MED of UV-B radiation

Doping the ormosils with ZnO nanoparticles clearly lead to increase in the photochromic activity as seen in Figure 1. The electronic spectra also suggests an effect on the bleaching time; the undoped sample bleached faster (bleached after 23 minutes) than the sample containing 0.263g/L of ZnO (bleached after 70 minutes), for example. Both effects in the photochromic response are tentatively assigned to the photoinduced electron transfer from the ZnO toward the adsorbed phosphotungstate increasing the concentration of the adsorbed heteropolyblue responsible for the bluish color formed under UV irradiation of the ormosil.

Keywords: Polyoxometalate, sol-gel, photochromism, organic-inorganic hybrid materials

Work supported by CNPQ and FAPESP.

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