

Photochromic dynamics of organic – inorganic hybrids supported on transparent and flexible recycled PET

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Organic – inorganic hybrid (OIH) materials containing phosphotungstic acid (PWA) entrapped have attracted enormous attention aiming photochromic applications¹⁻². Especially those based on Di-ureasils synthesized by sol gel process, coloration and bleaching behavior can be tuned by controlling the polymer chain length³. Poly(ethylene terephthalate) (PET), a synthetic polymer, has been widely applied in many different fields such as food packages and also as potential substrate for flexible devices due to its enormous advantages, for example, flexibility, high transparence in the visible range, solvent resistance, dimensional and thermal stability⁴. Precursor d-UPTES230 (termed d-UreaPropylTriethoxysilane, d-UPTES) where U represents urea groups and 230 g.mol⁻¹, the average molecular weight of the organic chain was synthesized grafting the polymer chain to a silicious network by means of urea linkages. In this investigation, OIH based on Di-ureasil were supported on recycled transparent PET substrate for photochromic applications. Films were characterized by XRD, IR-ATR, thermal analysis, contact angle and UV-Vis spectroscopy. Pristine hybrid and those containing PWA exhibited amorphous structures. Moreover, IR-ATR presented the main bands of PET, Hybrid matrix and also the interaction between them by intermolecular forces. Besides that, recycled PET substrate and films are thermally stable up to 380 and 325 °C, respectively. Contact angle of 25.1° showed a good wettability between recycled PET and hybrid *sol*. Photochromic films were sensitive to UV radiation and changed its color after 1 min of exposure to a mercury lamp reaching maximum intensity of the blue color at 90 min. Bleaching process as a function of the temperature, 50, 60 and 70 °C revealed that the relaxation is dependent of the temperature presenting activation energy of 49.6 kJ.mol⁻¹. This new approach arises as a potential application for photochromic flexible devices.

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