

Effect of polyoxometalate concentration in photochromic organic – inorganic hybrid material by solvolysis route

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Organic – Inorganic hybrids play an important role in the development of photochromic materials^{1,2}. Photochromic properties are directly related to the interactions between hybrid matrix and photosensitive specimens such as polyoxometalates - POMs. Di-ureasils have been considered a promising hybrid host to incorporate POMs due to its polymer chain length that can be controlled and consequently affecting the photochromic behavior³. In this investigation Di-ureasil hybrid named U(2000), where (2000) represents the average molecular weight of the polyether units, covalently grafted a silicon skeleton by means of urea groups (U), were obtained. Sol gel process, through solvolysis route, were performed by means of carboxylic acid (valeric and formic). Phosphotungstic acid (PWA) was incorporated in the matrix in different concentration ranging from n = 50, 100, 200 and 400. n values represent the molar ratio between PWA and oxypropylene units of the Di-ureasil hybrids (n = [CH₃CHCH₂O]/PWA). Structural, thermal and photochromic behavior of the materials were characterized by FTIR, thermal analysis, XRD, Raman and UV-Vis spectroscopies. Hybrids showed amorphous structures for all PWA concentration incorporated, suggesting that polyoxometalates are well dispersed in the matrix. Pristine hybrids are thermal stable up to approximately 300 °C and the onset temperature decrease as a function of the PWA content probably due to interaction with hydrogen bonding of the hybrid matrix. FTIR and Raman spectroscopies showed that interaction between PWA and Di-ureasil occurs. Photochromic behavior revealed that the color of hybrids have changed from transparent to blue after UV irradiation. Two bands at about 490 and 700 nm attributed to d-d reduced (W⁶⁺ - W⁵⁺) and intervalence charge transfer (IVTC) appears. Solvolysis route is a promising synthetic method, in an absence of water, to obtain functional photochromic materials.

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