

Synergic effect of magnetite nanoparticles and cellulose nanocrystals on shape-memory behaviour

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Abstract

Shape-memory polymers (SMP) are a kind of polymeric smart materials which stand out due to their ability to fix a temporary shape and recover their original shape as a response to an external stimulus. [1] Among SMP, segmented polyurethanes (STPU) are one of the most noteworthy because of their versatility. STPU are block copolymers formed by two blocks, the composed by a macrodiol and the formed by a diisocyanate and a low molecular weight chain extender.

According to economic, environmental and social concerns, the interest in the design of STPU derived from renewable sources is increasing. Therefore, in the last decade different biobased macrodiols, diisocyanates and chain extenders are employing in the synthesis of STPU. [1,2]

Moreover, shape-memory properties of STPU can be enhanced by loading different nanoentities. In addition, the incorporation of magnetic nanoparticles, such as magnetite nanoparticles (MNP), allows

possibility to activate the shape recovery by applying a magnetic field, instead of heating up the sample. [3]

In this work thermo- and magneto-responsive biobased polyurethane bionanocomposites were prepared, loading different amounts of MNP, cellulose nanocrystals (CNC) and a combination of MNP and CNC (Figure 1). The effect of the nature and amount of the nanoentities on shape-memory properties was analysed.

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Figures

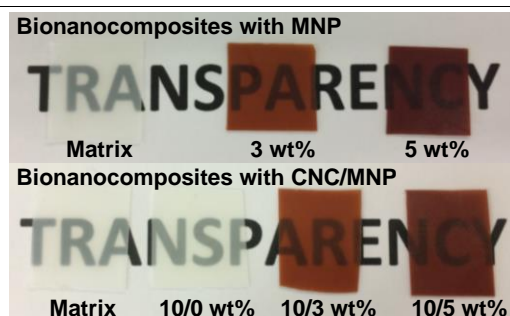


Figure 1: Digital images of the obtained polyurethane bionanocomposite films.