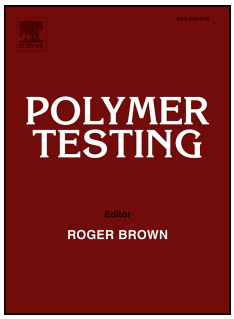
Accepted Manuscript



Nanocomposites with shape memory behavior based on a segmented polyurethane and magnetic nanostructures

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PII: S0142-9418(17)31568-4

DOI: 10.1016/j.polymertesting.2017.12.012

Reference: POTE 5264

To appear in: *Polymer Testing*

Received Date: 26 October 2017

Accepted Date: 9 December 2017

Please cite this article as: G.D. Soto, C. Meiorin, D. Actis, P. Mendoza Zélis, M.A. Mosiewicki, N.E. Marcovich, Nanocomposites with shape memory behavior based on a segmented polyurethane and magnetic nanostructures, *Polymer Testing* (2018), doi: 10.1016/j.polymertesting.2017.12.012.

Material Behaviour

NANOCOMPOSITES WITH SHAPE MEMORY BEHAVIOR BASED ON A SEGMENTED POLYURETHANE AND MAGNETIC NANOSTRUCTURES

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ABSTRACT

Shape-memory composites based on a commercial segmented polyurethane and magnetite (Fe_3O_4) nanoparticles (NPs) were prepared by a simple suspension casting method. The properties of the resulting nanocomposites, containing 1 to 10 nominal wt.% magnetic particles, were evaluated by thermogravimetric tests, contact angle measurements, differential scanning calorimetry, infrared and X-ray spectroscopy, static and thermal cyclic tensile tests, dynamic mechanical analysis and experiments of alternating-magnetic-field heating. It was found that most of the suspended NPs could be successfully incorporated into the polyurethane matrix, and thus composite samples with up to 7 wt.% actual concentration were obtained. On the other hand, the incorporation of magnetite nanoparticles to the shape memory polyurethane did not significantly affect most of the matrix properties, including its shape memory behavior, while added magnetic response to the nanocomposites. Thus, nanocomposites were able to increase in temperature when exposed to an alternating magnetic field, which allowed them to recover their original shape quickly by an indirect triggering method.

KEYWORDS: polymeric nanocomposites; shape memory behavior; magnetic nanostructures; indirect triggering method.