Verres, Céramiques & Composites, Vol. 4, N°2 (2015), 1-4

AN EXPERIMENTAL INVESTIGATION OF PHYSICAL OF DRY AND SWOLLEN ELASTOMER/CARBON BLACK NANOCOMPOSITES

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Abstract

The main focus of this work is to report an experimental investigation of physical and mechanical properties of dry and swollen nanocomposite samples prepared by incorporating carbon black (CB) particles into a semi-crystalline elastomeric matrix. Firstly, the time dependence on the swelling response of a series of samples with various fractions of CB particles was studied by the method of sorption kinetics using a toluene solvent at room temperature. It is shown that the normalized amount of the mass sorbed solvent $\Delta m(t)$ increases with time (t) and then saturate to a plateau value. The diffusion of solvent molecules in these filled elastomeric composites is found to follow a Fickian diffusion mechanism. Next, our composite samples are mechanically characterized before and after the swelling for a test time of 74h. The stress-strain curves highlight that the strength and elongation at break of the swollen samples remarkably decrease i.e. 60% compared to the dry samples. Lastly, the low-frequency dielectric measurements in presence or not of the small toluene molecules let to the general trend shown in the mechanical behavior.

Keywords: Absorption kinetics, Dielectric behavior, Mechanical behavior, Nanocomposite, Swelling.