P-11-742

NANOCOMPOSITE FOAMS BASED ON PEN AND GRAPHITE: FOAMING PROCESS AND PHYSICAL PROPERTIES

L. Sorrentino[1,2,*], M. Aurilia[2], L. Cafiero[1], S. Cioffi[1], S. Iannace[1,2]

[1]*Institute for Composite and Biomedical Materials (IMCB)-CNR P.le E.Fermi 1, località Porto del Granatello, 80055 Portici (Naples), Italy and* [2]*Technological District on Polymeric and Composite Materials Engineering and Structures (IMAST), P.le E.Fermi 1, località Porto del Granatello, 80055 Portici (Naples), Italy*

**Corresponding author: luigi.sorrentino@cnr.it*

The foaming process of nanocomposites based on high-performance thermoplastic polymer, namely poly(ethylene-2,6-naphthalate) (PEN), reinforced by expanded graphite was investigated. Matrices were prepared by melt blending through extrusion. A good dispersion of particles was achieved, as confirmed by XRD analysis, and no aggregates were detected trough optical and SEM analyses. Crystallization kinetics of matrices were enhanced by the presence of dispersed nanoparticles and thermomechanical behavior (DMA) of filled matrices was improved.
The solid state foaming technique was used to prepare foams. After supercritical carbon dioxide solubilization into samples, they were quickly heated to the desired foaming temperature. The effects of processing parameters on cellular morphology were analyzed and related to the filler content. Foams prepared from PEN nanocomposites showed lower cell diameters and higher number of nucleated cells with respect to neat PEN based foams. Expanded graphite nanoparticles resulted to be an effective nucleating agent for bubbles in PEN nanocomposites, exhibiting a widened temperature range for foaming. This behavior was attributed to either heterogeneous nucleation of cells or improved bubble stabilization, due to the increase of both viscosity and crystallization kinetics of the nanofilled matrices. Mechanical properties of nanocomposite foams were evaluated in quasi-static and dynamic conditions and results were related to the matrix composition. A predictive model of the mechanical behavior of foams prepared is also proposed.