Poster

STUDY OF THE PROCESSING-STRUCTURE-PROPERTIES OF POLYAMIDE NANOCOMPOSITE

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Nano materials and technologies in a wide range of fields (e.g. materials, biology, electronics, etc.) have been studied and developed intensively in the past years. No exception to this trend is the polymer/plastic field of applications. Polymer nanocomposites, a nano material incorporated into a resin are gaining acceptance in the mainstream of plastics, few commercial materials are already available in the market.

Polymer nanocomposites are polymeric materials in which a nano additive (nanoclay) has been incorporated. Due to the nano scales dispersion resulting in high area ratio and surface area, the reinforcement efficiency of polymer-clay nanocomposites can be significantly better than more conventional mineral fillers at a much lower filler content, generally lower than 5% by weight.

Nanocomposites performance depends on the degree of nanoclay de-agglomeration and dispersion within the polymer matrix. The maximum benefits are achieved when the platelets are well dispersed.

This work presents the compounding and characterization of nanocomposites samples based on polyamide and nanoclay (organosilicate). These nanocomposites have been obtained by "Melt intercalation" process, which consists of blending a molten thermoplastic with a organosilicate in a commercial mixing extruder in order to optimize the polymer-layered silicate interactions. The structural (XRD, TEM, and AFM), thermomechanical (TGA) and mechanical properties (Izod impact, Young's Modulus, Yield strength) are characterized and compared to the original polyamide properties.

Figures:

Sample	Cloisite (%)	Screw speed (rpm)	T_{di} (°C)	T_{vmd} (°C)	Residue (R_{∞}) at 700 °C	Basal spacing d_{001} (Å)	Specific gravity (g/cm³)	Shore D Hardness (°Sh D)	*E_r (MPa)
Conc. 1	50	380	276	427	29	36,6	-	-	-
Conc. 2	50	380	257	435	27	35,4	-	-	-
Conc. 3	50	380	256	429	31,6	35,7	-	-	-
PA_6	-	-	354	466	-	-	1,391	82	10028
11	3	380	384	473	1,6	exfoliated	1,505	84	11774
12	3	220	385	469	2,1	exfoliated	1,402	83	10664
13	6	380	374	470	4,3	exfoliated	1,404	81	10687
14	6	220	355	461	4	exfoliated	1,416	81	11720
15	9	380	378	462	6,3	exfoliated	1,519	76	12226
16	9	220	385	464	5,8	exfoliated	1,392	82	10035
17	6.5	380	374	460	4,5	41,0	1,463	83	10832
18	6.5	220	352	463	3,5	39,4	1,488	64	12325

"d": decomposition, "i": initial, "vmd": maximum rate of decomposition
*Apparent Dynamic Modulus of Elasticity

Figure 1. The TGA, XRD results, physico-mechanical and dynamical-mechanical properties of nanocomposites compared to PA