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Effect of ionizing radiation in nanocomposites of nylon 6,12 and pseudoboehmite

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Abstract – This work deals with the study about the effects of ionizing radiation on the nanocomposites properties obtained with pseudoboehmite, synthesized by sol-gel process, and nylon 6,12 through the addition of different pseudoboehmite concentration. The nanocomposites were prepared by intercalation fusion, the samples were molded by injection, irradiated and submitted to thermal and mechanical tests to none irradiated and irradiated material. The melting index fluid and the impact resistance were reduced by this addition, due to the nanofiller/matrix effect on the polymeric matrix crystallinity. The irradiation process impairs the mechanical and thermal properties, due to the polymeric matrix degradation inducing brittleness and enhancing rigidity.

Polymeric nanocomposites are related to a class of hybrid materials based on inorganic nanometric particles dispersed in a polymeric matrix, improving the material properties, saving cost as comparing with the conventional composites, therefore they achieve a high performance level with a low filler additions. The fillers present high superficial area, promoting a better dispersion in the polymeric matrix and therefore an improvement of the physical properties of the composites, direct related on the homogeneity of the material [1]. This work deals with the study about the effects of ionizing radiation on the nanocomposites properties obtained with pseudoboehmite, synthesized by sol-gel process[2], and nylon 6,12 through the addition of different pseudoboehmite concentration, 0%, 1%, 3% and 5%[3]. The nanocomposites were prepared by intercalation fusion, the samples were molded by injection, irradiated and submitted to thermal and mechanical tests. The mechanical properties (hardness, impact strength and tensile strength), as well as the thermal properties (thermal distortion temperature and Vicat softening temperature) of the nanocomposites, none irradiated and irradiated were determined. The irradiation levels were 30, 50 and 100 kGy in an gamma cell. Regarding the mechanical properties of non-irradiated samples, the incorporation of pseudoboehmite to nylon 6,12, resulted in an increase in the hardness, compressive strength, thermal resistance. The melting index fluid and the impact resistance were reduced by this addition, due to the nanofiller/matrix effect on the polymeric matrix crystallinity. The irradiation process impairs the mechanical and thermal properties, due to the polymeric matrix degradation inducing brittleness and enhancing rigidity. MEV images show the pseudoboehmite dispersed in the polymeric matrix.

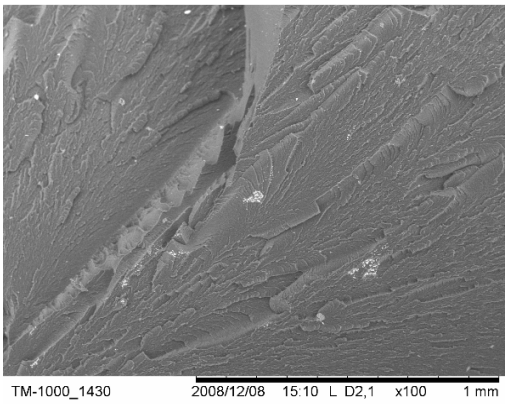

Figure 1: MEV image of nylon 6,12/pseudoboehmite 1w%

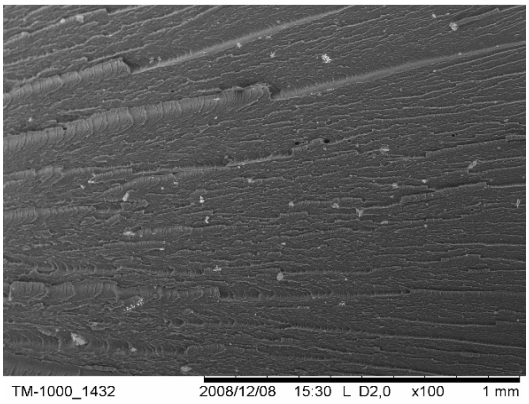

Figure 2: MEV image of nylon 6,12/pseudoboehmite 3w%

References

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