

Mechanical Characterization by Nanoindentation of Polypropylene/Cloisite 15A Nanocomposites Films Exposed to Gamma-Irradiation

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Abstract.

Nanoindentation technique is considered as a fast characterization tool for polymer degradation study since it is sensitive to the early stage of aging [1]. In this paper, the effect of γ -irradiation on the mechanical properties of polypropylene/Cloisite 15A (5wt%) nanocomposites were investigated by nanoindentation up to 100 kGy. The film samples with an average thickness of 150 μ m were prepared by melt compounding with and without PP-*grafted*-maleic anhydride used as the compatibilizer at 20wt%. Changes in the chemical structure of irradiated samples were monitored by FTIR spectroscopy. Nanoindentation results indicated an increase in modulus and hardness with the dose, however much higher for the compatibilized samples compared to the uncompatibilized ones and PP matrix. FTIR spectra of the irradiated samples showed a strong absorption band at 1715 cm^{-1} assigned to ketone groups whose intensity increased with the dose. The oxidation rate of PP nanocomposites was much faster than that of the neat PP. The overall results indicated that the nanoindentation data are consistent with those obtained by FTIR spectroscopy.

1. T. Pertin, G. Minatchy, M. Adoue, A. Flory, L. Romana, Polym. Test. 81 (2020) 160194.