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PHOTO-OXIDATION OF PA6/GRAPHENE OXIDE FILMS

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Graphene oxide (GrO) was synthesized with Marcano's method [1] and added at 0.5 and 1 wt% loading content to a polyamide 6 (PA6). In particular, three different techniques have been used for the preparation of the nanocomposites: (i) melt blending in a batch mixer, (ii) solvent casting in formic acid, (iii) preparation of a masterbatch by solvent casting and further melt processing. The films (80 μm) were photo-oxidized in a QU-V chamber up to about 100 hours. The effect of filler content and preparation technique on the photo-stability of the nanocomposites has been followed by monitoring the change of the mechanical and spectroscopic properties undergone upon artificial exposure to UV-B light. The elongation at break is an excellent parameter to establish the photo-oxidation resistance of polymer materials as it is very sensitive to the molecular and morphological changes undergone by the polymer during irradiation [2]. Indeed, these changes strongly affect the values of the elongation at break. The dimensionless elongation at break as a function of the exposure time of nanocomposite films is reported in Fig. 1. The results clearly show that adding GrO determines a strong increase of the photo-stability of the PA6 in almost all the cases. Moreover, it is possible to notice a strong interaction between filler content and preparation technique adopted. The materials prepared according to (i) take advantage by higher level of filler loading, while undergo a rapid degradation after 48 h when loaded with 0.5 wt% of GrO. Those prepared according to (ii) are more resistant and their dimensionless EB plots, not influenced by GrO content, are steady within the temporal range investigated. The photo-oxidation behaviour of the materials prepared according to (iii) was halfway between (i) and (ii) at lower loading and was found to be closer to that of the PA6 when GrO is loaded at wt1%, thus confirming a worsening of the photo-resistance upon increasing filler content.

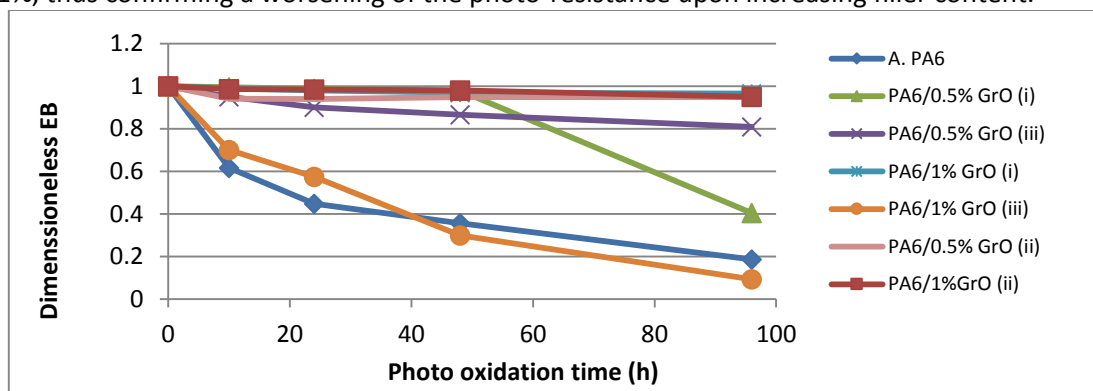


Fig. 1. Normalized elongation at break vs photo-oxidation time of the nanocomposites investigated.

References

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