

## Evaluation of the sunlight degradation of HDPE and PP Silicon nanocomposites.

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Polyolefins are the polymers with the largest volume market because of their excellent mechanical and thermal properties. Polyethylene (PE) and polypropylene (PP) are extensively produced and also a huge variety of copolymers can be synthesized by changing the type and content of co-monomer. Furthermore many additives may be added to improve or fashion new features. One of those additives is the silicon powder. polydispersed colloidal particles have been found to block the sun radiation. In fact, it is more efficient than protecting with the additives conventionally used. Several publications showed that the photodegradation of polyolefins in presence of oxygen results in change of the initial polymer structure due to the oxidative products [1-2]. It was reported that PP has a higher oxidation rate than PE which better resists the sunlight degradation [3-4]. The thermal properties of polyolefins mixed with Silicon powder exposed to sunlight radiation have been analyzed as an indicator of the effect of the Silicon on the degradation of the HDPE and PP.

Different quantities of Silicon powder (0.1, 1 and 5% in weight) were added to the HDPE and PP and subsequently the materials were exposed in accelerated radiation chamber to an exposure time corresponding to 14 months of sunlight radiation. Scanning Electron Microscopy experiments verified the well dispersion of the powder in the polymers. Differential Scanning Calorimetry was used to assess the thermal properties of the degraded samples, as well as to select the percentage of Silicon particles that ensures the blocking of the radiation. In the samples with low content of Si the crystallization and the melting temperature dramatically decreased after exposing to sunlight radiation. This fact indicates that the chemical structure of the sample was affected by the oxidation and some groups formed can act as defects in crystallization. For HDPE, 1%w of Si was enough to stabilize and block the effect of radiation of the polyethylene for more than a year. The hindering of photodegradation by addition of Silicon was also noticeable for PP. Only the sample with Si 5%w did not disintegrate before 8 months.

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