

Effect of starch nanoparticles on the crystallization kinetics and photodegradation of high density polyethylene

Amigo, Nicolás

Palza, Humberto

Canales, Daniel

Sepúlveda, Francesca

Vasco, Diego A.

Sepúlveda, Francisco

Zapata, Paula A.

© 2019 Elsevier Ltd Starch nanoparticles (SNp) with a diameter of ca. 70 nm were synthesized and used as fillers to prepare high density polyethylene (PE) composites by in situ polymerization. The effect of these particles on the thermal degradation, isothermal and nonisothermal crystallization, and photodegradation of PE was studied. SNp decreased the thermal degradation temperature of PE as tested by thermogravimetric analysis and increased the relative crystallinity and crystallization rate under isothermal conditions. This nucleating agent effect was confirmed by nonisothermal crystallizations as composites presented higher crystallization temperatures than neat PE. The photodegradation tests under UV radiation during 28 days showed that NPp promoted the polymer degradation by increasing the amount of carbonyl groups and by forming cavities at the nanoparticle/PE interface. Our findings open up new strategies for using SNp as filler in PE matrices to increase not only its photodegra