



PHOSPHOROUS BASED ORGANIC-INORGANIC HYBRID MATERIALS ELABORATED BY REACTIVE PROCESSING

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The emergence of nanocomposites has opened new perspectives in many fields of application for polymers. At the nanoscale, materials can acquire unexpected properties. Nanocomposites elaboration is classically carried out by dispersion of preformed fillers in a polymer matrix. Very often, this approach did not allow to reach the nanometer scale and limits fillers application to polymer reinforcement. Few years ago, we developed a new approach consisting of the in situ generation of the inorganic phase during polymer processing. The syntheses are based on hydrolysis-condensation reactions of alkoxy silanes precursors dispersed in a polymer matrix without addition of solvent during extrusion processing. A first example¹ concerns the synthesis of an organic-inorganic hybrid based on EVA (Ethylene-Vinyl acetate copolymer) matrix in which silica is created from the crosslinking polymer bridge. The synthesis of silicophosphorated fillers in molten PA6 has also been recently developed². These nanocomposites presented better fire resistant properties compared to PA6 because of the formation of a char layer acting as a thermal barrier. Combining these two studies, we are now developing a new hybrid material EVA/silicophosphorated precursor (diethylphosphato ethyltriethoxysilane -SiP-) based on alkoxy silane-ester exchange reaction leading to the incorporation of phosphorous at the molecular scale. First, the kinetics of the exchange reaction was performed from EVA model compounds under conditions as close as possible to those used in the EVA molten state. Then, the crosslinking reaction was studied by rheology and TGA-GC-MS. The fire behavior of the hybrid material was compared to virgin EVA.