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Investigation of thermal stability of ethylene copolymers with POSS - study under static and dynamic conditions

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Abstract

In the paper there was studied thermal stability of a series of ethylene copolymers with monoalkenylsiloxy- or monoalkenylsilsesquioxanes (POSS) under dynamic and static conditions. The copolymers proved to be more thermally stable than neat polyethylene and neat silsesquioxane comonomers. The kind and the content of the POSS units significantly affected degradation of the copolymers. Thermal oxidation process resulted in structural changes of the (co)polymers as it was evidenced by the variations in the kind and content of carbonyl, as well as by unsaturated end groups. Depending on the structure of the POSS comonomer incorporated into the polymer chain, the silsesquioxane units offered different stabilities which affected thermal oxidation resistance of the copolymer products. The kind and the POSS content determined the role of silsesquioxane units which may act as accelerating or stabilizing agents during thermal degradation of the copolymers. Thermo-oxidative process was also shown to affect melting and crystallization behavior of ethylene/POSS copolymers. Hampering decrease of lamellae thickness by POSS units was demonstrated for aged copolymers and the range of changes was dependent on POSS incorporation level which influenced also the homogeneity of the polymeric products.

Keywords: thermal oxidation, degradation, ethylene, polyhedral oligomeric silsesquioxane (POSS), copolymers