

Influence of Synergistic/Antagonistic Mixtures of Oligomeric Stabilizers on the Biodegradation of γ -Sterilized Polyolefins

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Abstract : Our previous studies aimed to investigate the biodegradation of γ -sterilized polyolefins in composting and microbial culture environments at different doses and γ -dose rates. It was concluded from the previous studies that the pretreatment of γ -irradiation can accelerate the biodegradation of neat polymer matrix in biotic conditions significantly. A similar work was carried out to study the stabilization of γ -sterilized polyolefins using different mixtures of stabilizers which are approved for food-contact applications. Ethylene-propylene (EP) copolymer has been melt-mixed with hindered amine stabilizers (HAS), phenolic antioxidants and hydroperoxide decomposers. Results were discussed by comparing the stabilizing efficiency, combination and consumption of stabilizers and the synergistic and antagonistic effects was explained through the interaction between the stabilizers. In this attempt, we have aimed to study the influence of the synergistic and antagonistic mixtures of oligomeric stabilizers on the biodegradation of the γ -irradiated polyolefins in composting and microbial culture. Neat and stabilized films of EP copolymer irradiated under γ -radiation and incubated in compost and fungal culture environments. The changes in functional groups, surface morphology, mechanical properties and intrinsic viscosity in polymer chains were characterized by FT-IR spectroscopy, SEM, instron, and viscometric measurements respectively. Results were discussed by comparing the effect of different stabilizers, stabilizers mixtures on the biodegradation of the γ -irradiated polyolefins. It was found that the biodegradation significantly depends on the components of stabilization system, mobility, interaction, and consumption of stabilizers.

Keywords : biodegradation, γ -irradiation, polyolefins, stabilization

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