

Stabilization of γ -Sterilized Food, Packaging Materials by Synergistic Mixtures of Food-Contact Approval Stabilizers

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Abstract : Food is widely packaged with plastic materials to prevent microbial contamination and spoilage. Ionizing radiation is widely used to sterilize the food-packaging materials. Sterilization by γ -radiation causes degradation for the plastic packaging materials such as embrittlement, stiffening, softening, discoloration, odour generation, and decrease in molecular weight. Many antioxidants can prevent γ -degradation but most of them are toxic. The migration of antioxidants to its environment gives rise to major concerns in case of food packaging plastics. In this attempt, we have aimed to utilize synergistic mixtures of stabilizers which are approved for food-contact applications. Ethylene-propylene-diene terpolymer (EPDM) have been melt-mixed with hindered amine stabilizers (HAS), phenolic antioxidants and organo-phosphites (hydroperoxide decomposer). Results were discussed by comparing the stabilizing efficiency of mixtures with and without phenol system. Among phenol containing systems where we mostly observed discoloration due to the oxidation of hindered phenol, the combination of secondary HAS, tertiary HAS, organo-phosphite and hindered phenol exhibited improved stabilization efficiency than single or binary additive systems. The mixture of secondary HAS and tertiary HAS, has shown antagonistic effect of stabilization. However, the combination of organo-phosphite with secondary HAS, tertiary HAS and phenol antioxidants have been found to give synergistic even at higher doses of γ -sterilization. The effects have been explained through the interaction between the stabilizers. After γ -irradiation, the consumption of oligomeric stabilizer significantly depends on the components of stabilization mixture. The effect of the organo-phosphite antioxidant on the overall stability has been discussed.

Keywords : ethylene-propylene-diene terpolymer, synergistic mixtures, gamma sterilization, gamma stabilization

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