

Effect of Accelerated Aging on Antibacterial and Mechanical Properties of SEBS Compounds

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Abstract : Thermoplastic elastomers (TPE) compounds are used in a wide range of applications, like home appliances, automotive components, medical devices, footwear, and others. These materials are susceptible to microbial attack, causing a crack in polymer chains compounds based on SEBS copolymers, poly(styrene-b-(ethylene-co-butylene)-b-styrene), are a class of TPE, largely used in domestic appliances like refrigerator seals (gaskets), bath mats and sink squeegee. Moisture present in some areas (such as shower area and sink) in addition to organic matter provides favorable conditions for microbial survival and proliferation, contributing to the spread of diseases besides the reduction of product life cycle due the biodegradation process. Zinc oxide (ZnO) has been studied as an alternative antibacterial additive due its biocidal effect. It is important to know the influence of these additives in the properties of the compounds, both at the beginning and during the life cycle. In that sense, the aim of this study was to evaluate the effect of accelerated aging in oven on antibacterial and mechanical properties of ZnO loaded SEBS based TPE compounds. Two different commercial zinc oxide, named as WR and Pe were used in proportion of 1%. A compound with no antimicrobial additive (standard) was also tested. The compounds were prepared using a co-rotating double screw extruder (L/D ratio of 40/1 and 16 mm screw diameter). The extrusion parameters were kept constant for all materials, screw rotation rate was set at 226 rpm, with a temperature profile from 150 to 190 °C. Test specimens were prepared using the injection molding machine at 190 °C. The Standard Test Method for Rubber Property—Effect of Liquids was applied in order to simulate the exposition of TPE samples to detergent ingredients during service. For this purpose, ZnO loaded TPE samples were immersed in a 3.0% w/v detergent (neutral) and accelerated aging in oven at 70°C for 7 days. Compounds were characterized by changes in mechanical (hardness and tension properties) and mass. The Japan Industrial Standard (JIS) Z 2801:2010 was applied to evaluate antibacterial properties against *Staphylococcus aureus* (*S. aureus*) and *Escherichia coli* (*E. coli*). The microbiological tests showed a reduction up to 42% in *E. coli* and up to 49% in *S. aureus* population in non-aged samples. There were observed variations in elongation and hardness values with the addition of zinc. The changes in tensile at rupture and mass were not significant between non-aged and aged samples.

Keywords : antimicrobial, domestic appliance, sebs, zinc oxide

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