Interfacial Adhesion between Ethylene-Propylene-Diene-Termonomer and Fluoroelastomer

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Extended Abstract

The adhesion that occurs at the interface of two rubbers depends not only on the surface energy but also the degree of physical or chemical crosslinking at interface. It is known that autohesion of elastomers depend on interfacial diffusion and molecular interlocking. Yet, in case of adhesion of two different rubbers crosslinked at different degrees, it is difficult to analyze the type of bonds involved and the fracture behavior at the interface of the bonded rubbers.

This paper describes the adhesion behaviors of carbon black-filled elastomers with their respective partially-cured counterparts having different degrees of crosslinking. Ethylene-propylene-diene-termonomer (EPDM) and fluoroelastomer (FKM) were explored as the elastomer matrices. The adhesion test was conducted by attaching the partially-cured sheet to the fully-cured elastomer sheet with the aid of a peel test. As expected, the adhesive strength was found to increase as the degree of crosslinking decreases. A correlation between the adhesive fracture energy, $G_a$ and the cohesive strength (tear strength in this study), $G_c$ were also investigated. It was found that the $G_a$ of EPDM sheets was much lower than the corresponding $G_c$ of a fully-cured EPDM sheet. However, both the $G_a$ and $G_c$ of the FKM rubber were more or less the same. Our most interesting observation is that a considerable adhesive strength exists between the fully-cured FKM sheets even after post curing, while the fully-cured EPDM sheets show no adhesive strength. The abnormal behavior for the FKM sheets might be responsible for the electrostatic attraction between hydrogen and fluorine present in FKM elastomer.


