Degradation characteristics of vulcanized natural rubber by dimethyl ether through filler and plasticizer composition variations

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Abstrak

Dimethyl ether (DME) is a type of renewable energy that could replace the use of fossil fuel in Indonesia. Nevertheless, DME can cause degradation of rubber-based materials. Therefore, the performance of rubber that has been degraded by DME must be improved. This research study aims are to determine the degradation characteristics of modified vulcanized natural rubber in a DME environment. The effect of the filler (carbon black) and plasticizer (minarex-B) components of vulcanized natural rubber was examined. The vulcanized rubber samples were comprised of 10, 30, and 60 parts per hundred rubbers (phr) of filler and 0, 10 and 20 phr of plasticizer. The degradation of the mass and mechanical properties of the rubber were investigated. Degradation testing was conducted by immersing the samples inside a pressure vessel that was filled with the liquid phase of DME. The results indicate that the increasing of the filler composition reduces the impact of degradation, while the increasing of the plasticizer composition has the opposite effect. The plasticizer is needed to distribute the filler to all parts of the rubber. Consequently, a filler composition of 30 phr and a plasticizer composition of 10 phr provide a vulcanized natural rubber with optional protection against the degradation caused by DME. The characteristics of natural rubber, as measured by Fourier Transform Infra-Red Spectroscopy (FTIR) proved that DME does not damage the structure of the polymer chains, although DME may react with some ingredients in the rubber that have a similar polarity.