Storage Instability of Fly Ash Filled Natural Rubber Compounds

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Generally, fly ashes (FA), by-product of power station plants, could function as either semi- or non-reinforcing fillers in polymeric systems, depending on their particle size, specific surface area and surface chemistry. Typically, FA particles are spherical with smooth surfaces possessing important influences on viscoelastic and mechanical properties. Additionally, the presence of heavy metals in FA particles could play role on degradation process of rubber molecules to some extent. In this article, the storage instability and thermal aging properties of FA filled natural rubber (NR) compounds were focused via changes in viscoelastic responses. Results obtained as shown in Figures 1 and 2 reveal that the storage duration of FA filled NR compounds leads to decreases in storage modulus and molecular weight, particularly in the compounds with high FA loading. It is believed that the presence of metal ions in both FA and non-rubber substances in NR could catalyze the degradation process of rubber molecules. To clarify the proposed hypothesis, NR was replaced by polyisoprene (IR) containing no non-rubber substances. The results demonstrate significant enhancement in storage stability as determined from storage modulus and molecular weight.

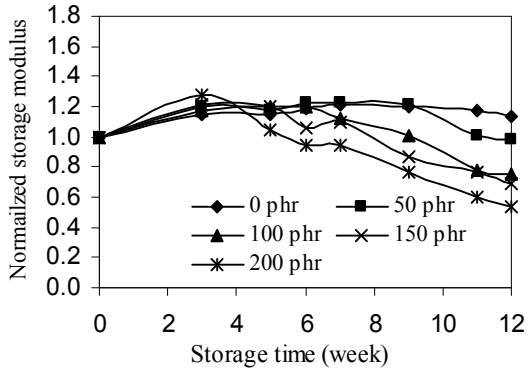

Figure. 1. Effect of storage time on the storage modulus (G′) of FA filled NR compounds

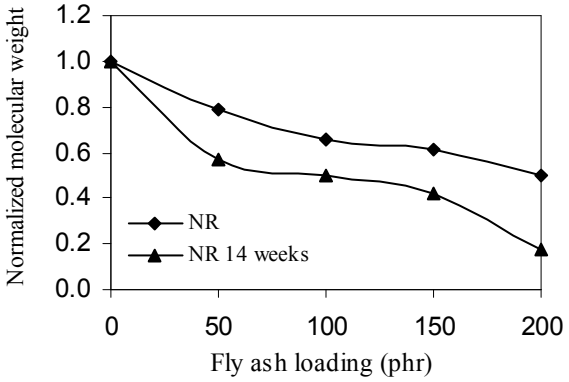

Figure 2. Normalized molecular weight of NR matrix of FA/NR compounds before and after 14-weeks storage

References

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