New cross-linking method of halogenated butyl rubber nanocomposites

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Butyl rubber (IIR) posses broad range of industrial applications, including production of tires, inner tubes, gaskets, electrical insulators, shock absorbers, hoses, adhesives and sealants, rubberised fabrics, aircraft engine mounts, conveyor belts as well as pharmaceutical closures [1,2]. This can be attributed to its unique properties, such as low gas permeability, exceptional heat resistance and compression-set properties or good resistance to ozone and solar radiation action [2].

Butyl rubber is synthesized from isobutylene in solution polymerization process. Unfortunately, there are no double bonds available for cure. Wherefore a small amount of isoprene is added to the polymerization process in order to provide unsaturated bonds necessary for cure. Additionally, halogenation process of butyl rubber can be carried out to add cross-linking sites into polymer structure [3].

Numerous studies have been dedicated to the vulcanization issue of butyl rubber. Nanocomposites made of butyl rubber can be cross-linked with conventional sulfur based systems (in the presence of active accelerators), peroxides or phenolic resins [2- 5]. Notwithstanding, in order to improve efficiency of this process, it is essential to find out an alternative.

In our work we applied metal complexes in combination with triethanolamine as cross-linking systems [6]. It is likely that cross-linking reaction proceeds in accordance with Heck mechanism.

This work aimed to study the effects of new curing agents on cross-linking process of bromobutyl rubber (BIIR). Composites filled with montmorillonite or carbon black were prepared. The rheometrical properties of rubber compounds as well as cross-linking degree and mechanical properties of vulcanizates were tested. Additionally, composites were subjected to thermo-oxidative ageing process and afterwards ageing coefficient was determined.

It has been found that metal complexes are active cross-linking agents.

Obtained vulcanizates indicated high value of cross-linking degree and demonstrated good mechanical properties. Furthermore nanocomposites exhibited outstanding barrier performance as well as improved thermal properties.

References

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