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## **The influence of the modification of channel black on properties of styrene-butadiene copolymer and butadiene-acrylonitrile copolymer**

### Abstract

Rubber reinforcement effect can be obtained by mixing and dispersing an appropriate amount of filler of specified properties (such as hardness, specific surface area) in rubber. There is a possibility to influence reinforcement effect by surface modification of filler particles. In this work carbon black was modified with compounds that contain amine groups. For example, N-2-aminoethyl-3-aminopropyltrimethoxysilane and diethylenetriamine were used for modification. As a result of this modification polarity of carbon black increased. Two kinds of rubber were used for the studies: polar and non polar. As a result of adsorption of the amine compounds, polar component of surface energy increased. Filler – filler and filler – polymer interactions were investigated. It turned out that vulcanizates containing non polar rubber and carbon black modified by amine compounds were mostly characterized by stronger filler – filler interactions than vulcanizates containing unmodified filler. It was also found that the modification decreased filler – polymer interactions in non polar rubber compounds. It was probably caused by the reduction of the active sites number on the carbon black surface by adsorption on the surface compounds used for modification. Mechanical properties, such as tensile strength, stress at 300% elongation and tear strength increased as compared to the properties of rubber containing unmodified carbon black. Based on the calculations, it was found that there is a strong correlation between filler – filler type interactions and the strength properties of the vulcanizates based on non polar rubber. It can be concluded that tensile properties of vulcanizates based on non polar rubber that contain carbon black modified by compounds with amine groups is mainly due to filler – filler interactions. In this case filler – polymer interactions are less important. Investigations have shown that filler – polymer interactions in polar rubber compound which contain modified carbon black were similar to filler – polymer interactions in rubber compound containing unmodified carbon black. This was probably due to the hydrogen bonding between NC groups of acrylonitrile – butadiene

rubber and amine groups of modifier that resulted in formation of stronger filler – polymer interactions. Modification caused stronger filler – filler interactions in polar rubber. Tensile properties such as tensile strength and stress at 300% elongation exhibited by vulcanizates that contained carbon black modified by compounds with amine groups were stronger than properties of vulcanizates with unmodified carbon black. The improvement of the tensile properties of vulcanizates based on nonpolar rubber was relatively better than for vulcanizates based on polar rubber. The correlation between filler – filler type interactions and strength properties of the vulcanizates of polar rubber was weaker than in a case of nonpolar rubber.

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