

ALTERNATIVE FILLERS FOR NEXT-GENERATION RUBBER COMPOSITES

Fillers are one of the major constituents of rubber materials and can contribute up to ca. 50 wt.%. Thus, they determine the rubber properties to a significant extent. The most widely used filler for rubber is carbon black (CB) produced from non-renewable fossil oils. In view of the global effort to reduce the utilization of non-renewable resources, a replacement of CB became one of the main topics in the rubber industry. However, this is a challenging task due to excellent reinforcing properties of CB (Fig. 1). Therefore, there is a high need for seeking environmentally-friendly fillers, able to provide the required rubber reinforcement.

Objective

The objective of this assignment is to test an alternative mineral or natural filler as potential environmentally-friendly replacement for CB. Various alternative fillers are available as natural or mined fine powders exhibiting specific surface properties and particle shape that could alter and improve rubber performance. The chosen fillers will be used as partial or full replacement of CB for rubber reinforcement. New rubber composites will be prepared and their properties evaluated in comparison with the state-of-the-art rubber filled with CB.

Assignment

At the beginning of the assignment the student will propose alternative fillers based on a literature research, the filler properties and their commercial availability. The final choice of the fillers will be done in agreement with the supervisor. Afterwards, the surface energy and morphology of the alternative fillers will be analyzed and a set of new rubber composites will be designed and manufactured. Their properties will be tested in comparison with the reference CB-filled rubber materials. The obtained results will be discussed based on the fillers characteristics, filler-filler and filler-rubber interactions and micromorphology of the composites.

The practical work will be performed in the laboratories of ETE at the UT.

Report

The graduation report should contain: **1.** The reasoning behind choosing the alternative filler type(s); **2.** Filler(s) characteristics in comparison to CB; **3.** Rubber composites preparation procedure; **4.** Testing results, their evaluation, discussion and conclusions.

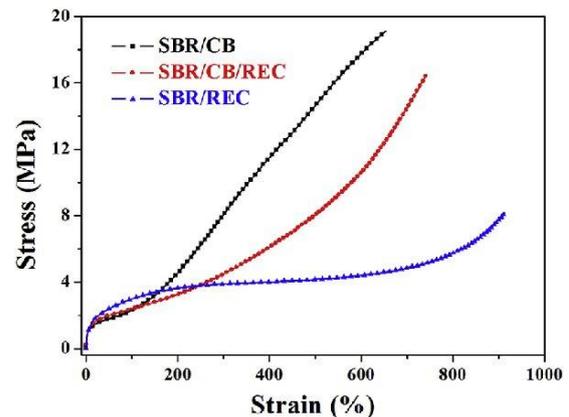


Fig. 1: Comparison of the reinforcing properties of CB and an alternative filler (REC) in SBR rubber [1]

Start:

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References:

[1] He, Shaojian, et al. "Aging properties of styrene-butadiene rubber nanocomposites filled with carbon black and rectorite." *Polymer Testing* 64 (2017): 92-100.