

CHANCES AND CHALLENGES OF CLOSING THE MATERIAL CIRCLE FOR PASSENGER CAR TIRE RUBBER

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ABSTRACT

Sustainability recently became one of the focus areas of material and product development in the elastomer world, including the tire industry. Worn-out-tires pose quantitatively as well as qualitatively the largest problem, but at the same time also the biggest challenge and potential: If the concentration of recycled rubber in tires can be increased significantly, the amount of reused rubber will increase considerably. The challenge is to develop a recycling technology, which produces a recycled rubber of high quality, high enough to fulfill the specifications for use in tires. One of the problems lies in the homogeneity and purity of the feedstock: different types of tires containing different compounds, external contaminations such as stones attached to the tire tread, and internal ones such as reinforcing fibers.

The most promising technology for a high quality recycled rubber is devulcanization. In this process, in the ideal case, only the sulfur crosslinks will be broken, resulting in a processable rubber with properties comparable to the ones of the feedstock.

An extensive study was done to devulcanize different types of feedstock and determine the quality of the resulting products. The feedstock was varied in terms of age of the tires, single tire parts versus whole tires, particle size of the granulated tire rubber, carbon black versus silica filled rubber, and different silica-silane combinations. In terms of the devulcanization process, pre-treatment of the ground tire rubber, type of process as well as processing time are discussed. Besides, the analysis of the recycled rubber will be discussed.

Finally, the sum of these considerations will result in an overview of the challenges and chances of devulcanization and reuse of whole tire rubber.