Insights into the steel-rubber adhesion

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The performance of many rubber products such as radial tires, handrails, hydraulic hoses etc. strongly depends on the adhesion of the rubber to the reinforcing material i.e. steel wires or cords. Because of the low direct binding of steel to rubber, the adhesion is achieved in most cases by a thin brass or zinc layer. Therefore, rubber-brass adhesion is a critical issue in rubber technology. The adhesion performance is, thereby, strongly influenced by the properties of the rubber mixture as well as the brass surface. Due to the strong adhesive strength of the rubber on the wire, it is very difficult to access the adhesion interface directly.

In this contribution we will give an introduction of the bonding mechanism between brass and rubber and will discuss different methods how to characterize this adhesion interface. For example, using olefin metathesis sulfur crosslinked rubbers can be selectively degraded using modern ruthenium catalysts resulting in the uncovering in the underlying metal surface, which is now accessible for further detailed characterisation.[1] Other appraoches are the filter paper method and the squalene method. In the latter case, a model system using squalene as liquid analogue to natural rubber simulates the formation of the adhesion layer by the reactive sulfur species during vulcanization. Pros and contras for the different methods will be discussed.

A detailed investigation of this adhesion layer is the basis for subsequent optimization of the rubber metal bonding.

1. S. Leimgruber, W. Kern, R. Hochenauer, M. Melmer, A. Holzner, G. Trimmel, Rubber Chem. Technol. **2015**, *88,* 219-233.