FATIGUE BEHAVIOUR OF INDUSTRIAL RUBBER BLENDS AND RUBBER–TEXTILE COMPOSITES

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In many applications rubbers are subjected to continuously cyclic loading. Therefore, the long-term durability and the mechanical properties under such loads are critical issues and many approaches can be found to characterize them. Another point is that many rubber products are reinforced with textile. This is less investigated in laboratory measurements but at product test rigs. Since investigations at the test rigs are time- and labour-intensive, it is preferable to find a reliable characterization method of the fatigue behaviour of rubber–textile composites in the laboratory.

In this work, the fatigue properties of application-relevant rubbers and rubber–textile composites are investigated. Crack growth and fatigue life measurements are carried out under cyclic tension-compression and pure tensile loads. The heat build-up and hysteresis are analysed. Two testing machines are used to investigate the fatigue properties under different loads and temperatures. For crack growth measurements, pure-shear (or planar-stress) specimens are used. For fatigue life measurements, the samples have the same thickness and length than the pure-shear specimens but a shorter width. The rubber-textile samples are based on the rubber sample geometries with one ply of symmetrically embedded textile.

Application-relevant SBR/BR/NR blends are used with different types and amount of carbon black. The textiles (woven mats) are common types for rubber products and consist of polyamide and/or polyester cords. The difference of the typical laboratory loading conditions to a real product loading case is studied for the rubber blends. Especially the distinctive heat build-up of the specimens at frequencies above 5Hz must be considered. For the rubber–textile composites, the influence of three textile types on the behaviour is shown. The fatigue life shows distinctive differences for the used textile types. Also the crack growth behaviour in comparison to that in pure rubber blends is analysed.