MAGNETIC FIELD SENSITIVE RUBBER NANOCOMPOSITES

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A particular group of magnetic materials, for which the interest have been regained in the last few years are the composites consisting of magnetic particles dispersed in a nonmagnetic, elastomeric matrix during the cross-linking process.
Composites made of ferromagnetic particles and a soft matrix belong to specific class of smart materials where the mechanical properties can be changed under different magnetic environments. The one of the aims of this work is investigate dispersion of ferrite magnetic particles in butadiene rubber.
Various types of ferrites (Ba, Sr) prepared in laboratory using co-precipitation and auto-combustion method and for the comparison wet milled commercial ferrite (Sr) were used as a magnetic fillers for magnetoactive elastomers. The morphology of the ferrite particles was observed. The atomic force microscopy and stress-strain measurements were used to obtain the results displaying the homogeneity of the magnetoactive elastomers. The change in the stiffness, elasticity on the content and particle size dependence in the presence and without the presence of the magnetic field is shown in this work.

Analysis of the results leads to the following: under the influence of the magnetic field a characteristic structuring of magnetic particles within the composite during curing takes place. Particles can move under the influence of the field to form magnetic structures of chains and it leads to the change of the physical-mechanical properties. The columnar structure of the particles in the elastomer matrix gives rise to tensile strength at break. An increasing content of ferrite gives rise to an increasing storage modulus and loss factor while applying magnetic field. The effect grows stronger with the smaller ferrite nanoparticles then with the microsized strontium ferrite.
Thus it can roughly be said that the stronger the magnetorheological effect, the higher content of magnetic particle with smaller particle size.

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- Herstellung und Charakterisierung von Ferriten
- Entwicklung magnetorheologischer Elastomere