Rheological properties of elastomeric magnetic composites

K. Hložeková[1*], J. Kruželák[1], A. Kvasničáková[1], I. Hudec[1], M. Gořalík[2]
[1]*Department of Plastics, Rubber and Fibres, Faculty of Chemical and Food Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
[2]*Centre of Polymer Systems, University Institute, Tomas Bata University, Zlín, Czech Republic*

Keywords. Rubber composites, rheology, magnetic filler, absorption shielding

Abstract.
Elastomeric magnetic composites represent a group of 'smart materials', combining the elastic properties of rubber matrices and the magnetic properties of metal magnets. Although their properties depend mainly on the type of elastomeric matrix, their processing, physical-mechanical and magnetic properties also depend on the type and content of the magnetic filler. Elastomeric magnetic composites show excellent elastic and magnetic properties, which are used in applications in microwave and radar technology, magnetic sensors and displays, magnetic or electromagnetic field sensors.
From the point of view of the application of magnetic fillers with high viscosity, there is a high probability of influencing not only physical-mechanical, but also rheological and processing characteristics of elastomers. Therefore the aim of this research is to evaluate the rheological characteristics of elastomeric composites, which were prepared by application of magnetically soft manganese-zinc ferrite in a concentration range from 100 to 500 dsk to rubber matrices based on natural (NR) and butadiene acrylonitrile rubber (NBR). An oscillating rheometer RPA 2000 was used to evaluate the rheological properties.
The dependences of the complex viscosity η^* and its components on the shear rate $\dot{\gamma}$ at 90°C were measured and evaluated. It has been found that at low shear rates the viscosity increases with increasing concentration of manganese-zinc ferrite, but at higher shear rates the filler has no significant effect on viscosity. The decrease in viscosity of composite materials with increasing shear rate indicates the pseudoplastic character of rubber blends.

Acknowledgement
This work was supported by the Slovak Research and Development Agency under the contract No. APVV-16-0136 and APVV-19-0091.