POLYURETHANE MAGNETORHEOLOGICAL ELASTOMER PREPARED THROUGH IN-SITU POLYCONDENSATION UNDER MAGNETIC FIELD

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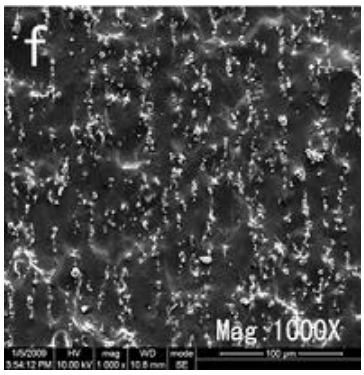
Magnetorheological elastomers (MREs) belong to a family of so-called smart material whose rheological properties can be controlled continuously, rapidly and reversibly by the application of external magnetic field. Polyurethane (PU) elastomer is a potential candidate for MREs in practical application due to its easy processability and adjustable properties. The highly filled polytetramethylene ether glycol (PTMEG) based PU magnetorheological elastomers (MREs) with anisotropic structure and good mechanical properties were prepared. The difficulty in dispersion and orientation of iron particles in PU elastomer was overcome by ball milling mixing and further in-situ one-step polycondensation under a magnetic field. The microstructure and properties of the composite were characterized in detail. Scanning electron microscope (SEM) showed that chain-like structure of carbonyl iron was formed in PU matrix after orientation under a magnetic field of 1.2 T. The aligned chain-like structure of carbonyl iron in PU greatly enhanced the thermal conductivity, the compression properties and the magnetorheological effect of anisotropic PU MREs compared to that of the isotropic one. When the test frequency is 1Hz, the maximum absolute and relative MR effect of anisotropic PU MREs with 26 wt% hard segment and 70 wt% carbonyl iron were ~ 1.3 MPa and ~ 21%, respectively.



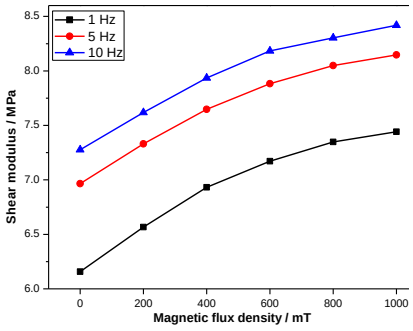


Fig.1 SEM of fractured surface of anisotropic PU MREs with 60 wt% iron (Left)
Fig.2 Magnetic field induced shear modulus increment of anisotropic PU MREs (Right)

Reference

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