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The conductive three dimensional topological structure enhanced magnetorheological elastomer towards a strain sensor

Lin Ge, Xinglong Gong*, Yu Wang, Shouhu Xuan

CAS Key Laboratory of Mechanical Behavior and Design of Materials, Department of Modern Mechanics, University of Science and Technological of China, Hefei, 230027, China

* Corresponding author.
Prof. Xinglong Gong
Email: gongxl@ustc.edu.cn

Abstract

Conductive magnetorheological elastomers (MREs) consisting of carbonyl iron particles (CIPs), polydimethylsiloxane matrix and carbon nanotube (CNT) covered polyurethane sponge (PUS) were developed. The CIPs were linearly orientated within the porous PUS and the magnetic saturation modulus of PUS-reinforced anisotropic MRE was 1.3 MPa when CIPs content was 70wt%. This MRE presented typical magnetorheological (MR) effects and the shear storage modulus increased from 0.49 MPa to 0.64 MPa after reinforcing the anisotropic MRE with PUS. Owing to the presence of the CNTs on the PUS networks, the final MRE was conductive. The electrical resistance of the MRE increased with increasing tensile strain, ranging from 27.5 kΩ to 30.5 kΩ at various tensile rates (50, 100, 150, 200, 250 and 300 mm/min respectively). As a result, the smart MRE was effective in a flexible, sensitive and reversible strain sensor.

Key words

Magnetorheological, mechanical properties, strain sensor.

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