

Modification of structure and properties of magnetorheological elastomer via heat treatment

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Modification of structure via heat treatment in different temperatures is known to result in a change of properties of Si-based magnetorheological elastomer (MRE). In this research, three different temperatures particularly 100, 125 and 150°C have been applied to MRE contained of 70 wt% CIP for 24 hours, individually and the resultant rheological changes of MREs were investigated. It was found that the MRE treated with 125°C exhibit the highest MR effect, about 88% respective to non-treated MRE. Furthermore, the corresponding initial storage modulus present the lowest, 0.284 MPa compared to 0.298 MPa of pure MRE indicating the improvement of an MRE's modulus elasticity. Meanwhile, at temperature of 150°C, it can be seen that the MR effect of the MRE

started to drop up to 50%. However, the storage modulus for all non-heat treated and heat-treated MREs increased exponentially as the frequencies and currents increased, respectively for both off- and on-state conditions. In fact, the increment trend of storage modulus as a result of frequency is followed by the increased of heat treatment temperatures; 20% for 100°C, 27% and 32% for 125 and 150°C, respectively compared to non-heat treated MRE, at 3A. The result shows that the heat treatment on the MREs enhanced the inter-particles bonding between the magnetic particles and rubber matrix that subsequently improve the structure and rheological properties of the MREs.

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