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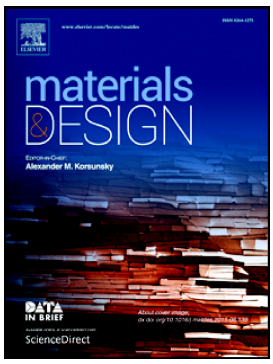

A new type of vibration isolator based on magnetorheological elastomer

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A new type of vibration isolator based on magnetorheological elastomer

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Abstract

In this work, a new type of adaptive vibration isolator based on magnetorheological (MR) elastomer (MRE) is presented. A new method was adopted to develop such an isolator where both a magnetic field and a preload were applied simultaneously. The magnetic attraction force was utilized to change the preload in the single degree of freedom (DOF) system. The system has such a provision that when a magnetic field is applied the preload would be automatically acting to the MR elastomer. In such a combined loading condition, the natural frequency of a single DOF system promptly shifted to a higher frequency and the stiffness of the MR elastomer was significantly increased. The stiffness of the MR elastomer system was found to be increased as high as 730 times of its original stiffness when the magnetic field of 520 mT was applied, which is a significantly higher augmentation than those reported in the literature. The combined effect of the preload and the magnetic field was profound because the magnetic interaction among the magnetic particles was simultaneously boosted by both the magnetic field and the preloading effect. It is often a large difficulty to generate a higher magnetic field in most of the MRE-based isolators. Our study showed that when a suitable preload and a suitable magnetic field are applied together, a highly tunable isolator system can be developed even with the application of a relatively lower magnetic field strength.

Keywords: MR elastomer; isolator; preload; magnetic field

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