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Constitutive model for shear yield stress of magnetorheological fluid based on the concept of state transition (Article) (Open Access)

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Abstract

View references (28)

Magnetorheological fluid (MRF) is a smart material whose rheological properties can be varied by a magnetic field; it has been applied in the development of semiactive dampers for a variety of applications. The material essentially consists of a suspension of magnetic particles in a nonmagnetic carrier fluid. It is important to understand the magnetic response of MRF and its dependence on several parameters for improving and designing MRF devices. The purpose of this work is to develop a constitutive model that describes the behavior of the shear yield stress of the material as function of the magnetic field and composition. Taking into account that the material changes its rheology and apparent viscosity according to magnetic field, a magnetically induced state transition is proposed; by the use of a state transition equation, a constitutive model for shear yield stress is defined, consisting of an expression that relates composition of the material and the stimulus applied, it also associates the volume fraction of particles, magnetic field and the material that composes the particles.

SciVal Topic Prominence

Topic: Magnetorheological fluids | Yield stress | Brakes

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constitutive equation | magnetorheological fluid | model | smart material

Indexed keywords

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Engineering uncontrolled terms: Apparent viscosity; Magnetic particle; Magnetic response; Magnetorheological fluids (MRF); Rheological property; Semi-active dampers; Shear yield stress; State transition equation

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