

Abstract Submitted
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Field-controlled adhesion in confined magnetorheological fluids

JOSE MIRANDA, SERGIO LIRA, Departamento de Fisica, UFPE, Brazil — The study of reversible, functional, and controllable adhesives is a matter of considerable practical interest, and academic research. We report the adhesive response of a magnetorheological fluid confined between two parallel plates under a probe-tack test, when it is subjected to an applied magnetic field. Our analytical approach is based on a Darcy-like law formulation which considers a magnetic field-dependent yield stress behavior. The adhesion force is calculated in closed-form for two different configurations produced by a Helmholtz coils setup: uniform perpendicular, and nonuniform radial magnetic fields. In both cases, we verify that adhesion force is hugely increased as a result of the field-dependent nature of the yield stress. This provides a versatile way to obtain a shear resistant, tough structural adhesive through magnetic means.

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