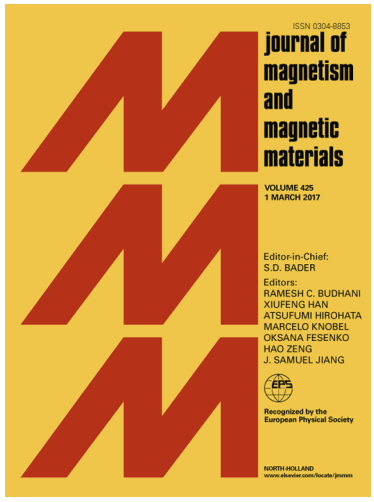

Research articles

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Experimental verification of negative magnetorheological characteristics in spindle-like hematite particle suspensions

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Short running title: Negative magnetorheological characteristics

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Highlights of the present paper:

(1) Negative magnetorheological effects have been verified experimentally.
(2) The dependence of the negative viscosity on the magnetic field strength has been clarified.
(3) Several situations of the weight percent concentration have been addressed.

Abstract

In the previous experimental study, we succeeded in verifying that the negative magnetorheological characteristics are observable in a hematite particle suspension, which was predicted by a theoretical study based on the orientational distribution function. The present study further advances the experimental investigation of the negative magnetorheological effect in order to obtain more detailed data of these negative magnetorheological characteristics. The viscosity contribution from magnetic properties has been measured using a cone-plate-type rheometer, located in the uniform area of the magnetic field, under various conditions of the magnetic field strength and the weight percent concentration. It is seen that a contribution to the viscosity of a hematite-glycerol-water dispersion from its magnetic properties, becomes negative and attains to a minimum value, after which the effect decreases and finally becomes positive with increasing magnetic field strength. These characteristics of the negative viscosity are in good agreement with the theoretical prediction that was obtained by the orientational distribution function.

Keywords: Magnetic colloidal dispersion, Hematite particle, Magnetorheology, Negative viscosity,