

## Transient Response of Rheological Properties of a CI-Water Based Magnetorheological Fluid under Different Operating Modes

**Authors :** Chandra Shekhar Maurya, Chiranjit Sarkar

**Abstract :** The transient response of rheological properties of a carbonyl iron (CI)-water-based magnetorheological fluid (MRF) was studied under shear rate, shear stress, and shear strain working mode subjected to step-change in an applied magnetic field. MR fluid is a kind of smart material whose rheological properties change under an applied magnetic field. We prepared an MR fluid comprising of CI 65 weight %, water 35 weight %, and OPTIGEL WX used as an additive by changing the weight %. It was found that the MR effect of the CI/water suspension was enhanced by using an additive. A transient shear stress response was observed by switched on and switched off of the magnetic field to see the stability, relaxation behavior, and resulting change in rheological properties. When the magnetic field is on, a sudden increase in the shear stress was observed due to the fast motion of magnetic structures that describe the transition from the liquidlike state to the solid-like state due to an increase in dipole-dipole interaction of magnetic particles. Simultaneously, the complete reverse transition occurs due to instantaneous breakage of the chain structure once the magnetic field is switched off.

**Keywords :** magnetorheological fluid, rheological properties, shears stress, shears strain, viscosity

**Conference Title :** ICRVV 2022 : International Conference on Rheology, Viscoelasticity and Viscosity

**Conference Location :** Tokyo, Japan

**Conference Dates :** February 24-25, 2022