

Fabrication and application of Magnetorheological fluids

Hyoung Jin Choi, Chun Yan Gao and Yu Zhen Dong
Inha University, South Korea

Magnetorheological (MR) fluids based on magnetically polarizable particles dispersed in non-magnetic fluids exhibiting a tuneable phase change from a liquid-like to a solid-like state by the application of an external magnetic field. In the absence of an external magnetic field, the magnetizable particles are dispersed randomly in the medium and the MR fluid exhibits Newtonian-like fluid behavior depending on the particle concentration. On the other hand, when a magnetic field is applied, the dispersed particles build up chain-like structures in the field direction due to an induced magnetic dipole–dipole interaction. Micron-sized carbonyl iron (CI) particles are the most widely applied commercial magnetic particles for MR fluids due to their high saturation magnetization and appropriate particle size; however, they are generally heavy to result in easy sedimentation in MR fluids. Hence, we have focused on improving the dispersion stability and MR performance of MR fluid with additive, such as hard magnetic γ - Fe_2O_3 nanoparticles, Halloysite clay, Fe_3O_4 @ SiO_2 , etc. In addition, synthesis of core-shell structured

microspheres through the coating CI particles with PGMA, PANI, and SiO_2 @MWNT using a dispersion polymerization method, which improved the dispersion stability by reducing the density of magnetic particles. These kinds of particles based MR fluids were examined by a rotational rheometer under an extra magnetic field strength with steady shear and dynamic oscillation tests.

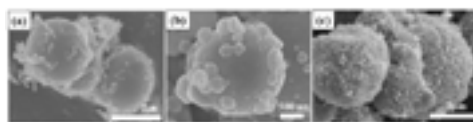


Figure 1. SEM images of (a) CI particles, (b) CI@PGMA composite, (c) CI@SiO₂@MWNT composite

Biography

Hyoung Jin Choi is Inha Fellow Professor at Inha University, Korea with BS from Seoul National University and Ph. D. in Chemical Engineering from Carnegie Mellon University in 1987. He joined Department of Polymer Science and Engineering at Inha University in 1988, and his research interests cover soft matter materials and complex fluids including electrorheology, magnetorheology, and polymer rheology. He is a member of Korean Academy of Science and Technology and a recipient of numerous scientific achievement awards including “World Class Research Front Award and Thomson Scientific Citation Laureate 2007 and the 2016 Top 300 Most Cited Researchers in Materials Science and Engineering by Elsevier Scopus Data.

hjchoi@inha.ac.kr

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