Linear Birefringence and Dichroism Measurements for Silica Coated Iron Oxide Ferrofluids

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The core-shell structural SiO₂/Fe₃O₄ nanocomposites were prepared via hydrolysis and condensation of tetraethyl orthosilicate (TEOS) by using iron oxide nanoparticles as seeds in a 2-propanol/distilled water mixed solvent using ammonia as catalyst. The water-based ferrofluid (FF) as 0.3 ml EMG 304 was adopted as the seed. The effects of ammonia aqueous amount, volume ratio of 2-propanol/distilled water, TEOS amount, and reaction time on size and dispersibility are investigated via transmission electron microscope and X-ray diffraction. Further, the linear birefringence and dichroism measurements of silica coated FF were investigated by a Stokes polarimeter. Results indicated that the appropriate reaction parameters including volume ratio of 2-propanol/distilled water of 5:1, ammonia solution volume of 0.5 ml, TEOS amount of 50 mg, and mechanical stirring of 1000 rpm for 3 h were found to obtain large retardance and low dichroism.

Index Terms—birefringence, dichroism, ferrofluids, nanocomposites.