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Light-transmitting measurements through starch-coated cobalt ferrite ferrofluids exposed to an external magnetic field

M. Šuljagić[+], L. Andjelković[+], P. Iskrenović[*], A. S. Nikolić[×], M. R. Milenković[×1)]

[+]*University of Belgrade-Institute of Chemistry, Technology and Metallurgy, Department of Chemistry, 11000 Belgrade, Republic of Serbia*

[*]*Faculty of Physics, University of Belgrade, 11000 Belgrade, Serbia*

[×]*University of Belgrade, Faculty of Chemistry, 11000 Belgrade, Republic of Serbia*

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Considering a need for magnetic materials that exhibit improved properties for magnetic resonance imaging (MRI) and AC magnetic field-assisted tumor therapy, we have recently investigated the magnetic behavior of starch-coated cobalt ferrites prepared by coprecipitation, mechanochemical, ultrasonically assisted coprecipitation, microemulsion, and microwave-assisted hydrothermal methods. The choice of the synthesis procedure determines the magnetic properties of cobalt ferrites [1]. As a continuation of previous research [1], to examine the behavior and agglomeration of possible MRI contrast agents based on the synthesized starch-coated cobalt ferrites, the transmitted light measurements at the 655 nm wavelength were performed through the ferrofluid suspensions exposed to the external magnetic field of 200–400 mT. The optical analysis of the external magnetic field influence on starch-coated cobalt ferrite nanoparticles in ferrofluid was conducted using a laboratory-designed apparatus [2]. Ferrofluid suspensions were prepared from starch-coated cobalt ferrite powders [1]. 0.50 g of each starch-coated $CoFe_2O_4$ was dispersed in 50 mL of deionized water followed by ultrasonically treatment (15 min at 80 °C). According to their optical behavior, the investigated samples can be classified into the two groups. The samples synthesized by ultrasonically assisted coprecipitation and coprecipitation procedures (group I) showed more pronounced effects of agglomeration and sedimentation under the influence of an external magnetic field in comparison to the samples synthesized by microemulsion, microwave-assisted hydrothermal method, and mechanochemical method (group II). Among all investigated samples, the samples from group II showed the lowest rate of chain formation and sedimentation. Since all the samples have the same chemical composition, the choice of synthesis method may have significant impact on their magnetic properties, as well as the further selection of possible MRI contrast agents.

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1)e-mail: mrm@chem.bg.ac.rs