EFFECT OF ULTRASONICATION ON MAGNETIC FE3O4 NANOPARTICLES

Gytautė Sirgėdaitė[1*], Lina Mikoliunaitė[1, 2]

[1] *Department of Physical Chemistry, Institute of Chemistry, Faculty of Chemistry and Geosciences, Vilnius University, Vilnius, Lithuania*
[2] *Department of Organic Chemistry, Center for Physical Sciences and Technology, Vilnius, Lithuania*
* gytaute.sirgedaite@chgf.stud.vu.lt

Magnetic nanoparticles have gained popularity due to their thermophysical properties, which can be applied in various disciplines - biology, medicine, chemistry, physics. There are many applications of nanoparticles, and they are making progress in many fields of science: surface-enhanced Raman spectroscopy, drug delivery, therapeutic agents for cancer treatment, magnetic resonance imaging, biological sensors, catalysts, magnetic recording media [1]. The applications for the Fe3O4 nanoparticles often require a controllable synthesis to obtain particles with desirable size and tunable magnetic properties [2].

Iron oxide nanoparticles have gained popularity due to their easy availability, easy synthesis, and superparamagnetic properties [3]. The size of the nanoparticles ranges from 10 nm to 100 nm. The shape and size of nanoparticles are important parameters for synthesis and application because a large surface area increases reactivity, ion transfer, or contact. Besides, physical properties such as shape, composition, charge, and solubility can unpredictably change nanoparticles behaviour. It is therefore important to discover methods to obtain desired size, shape, and properties of magnetic nanoparticles [1].

Due to the inter-particle adhesion forces, nanoparticles become agglomerated, and their settlement can be observed due to the gravity forces. To achieve the maximum benefit from nanoparticles while working with them, it is desired to have an aggregate- and sediment-free structure where all the nanoparticles contribute to the dispersion. Improving the dispersion stability of nanofluids through ultrasonication has been shown to be effective. It could be noted that ultrasonication is a complicated physiochemical process, which can break down the agglomeration as well as create further aggregation, and many other effects [4].

In this work we have investigated effect of ultrasonication on magnetic Fe_3O_4 nanoparticles using different ultrasonication equipment, and effect on nanoparticles using different stabilizers and mediums.

Acknowledgements. This research is funded by the European Social Fund under the No 09.3.3-LMT-K-712 “Development of Competences of Scientists, other Researchers and Students through Practical Research Activities” measure.

References

1. A. S. Teja, P.Y. Koh, Progress in Crystal Growth and Characterization of Materials, **55** (1-2), 22-45 (2009).
2. S. Ge, et al., The Journal of Physical Chemistry C, **113** (31), 13593-13599 (2009).
3. D. Xiao, et al., Microchimica Acta, **183** (10), 2655–2675 (2016).
4. I. M. Mahbubul, et al., Ultrasonics Sonochemical, **26**, 361–369 (2015).

=