**M-ERA.NET Call 2017 project**

**Flexible Magnetic Filaments: Properties and Applications.**

**Project Investigators:**

***University of Latvia*** *(Project Coordinator - Professor Andrejs Cēbers)*

***Cordouan Technologies/CNRS-LCPO*** *(Principal Investigator – Dr. David Jacob)*

***Institute of Experimental Physics SAS*** *(Principal Investigator – Dr. Peter Kopcansky)*

**Slovak research team: Peter Kopčanský, Milan Timko, Matúš Molčan\*, Katarína Paulovičová, Iryna Antal**

**Abstract.** In this talk, will be presented a granted *M-ERA.NET* project with the title *“Flexible Magnetic Filaments: Properties and Applications”*. Flexible magnetic filaments are interesting for applications as self-propelling microdevices (for targeted transport), micro-mixers (for microfluidics), different sensors for measurement of viscoelastic properties different fluids of biological origin. The key project objective is to create structures that can be manipulated with applied magnetic fields and to formulate mathematical models which will quantitatively predict their behaviour in magnetic fields of different configurations. The primary task is to manage fiber synthesis and particle binding. In general, it is possible through various methods. These include linking magnetic micro-particles by biotinized DNA fragments, attaching magnetic nanoparticles to polyelectrolyte bundles, extraction of chains of magnetosomes from magnetotactic bacteria and other. To do this the main contribution of the *Institute of Experimental Physics SAS* is the extraction of chains of magnetosomes from the magnetotactic bacteria. Some preliminary experimental results will be shown. The properties of the suspensions of magnetosomes extracted from magnetotactic bacteria are investigated. By the dynamic light scattering and dispersion of magnetic susceptibility measurements it is shown that sonicated samples with broken magnetosome chains have qualitatively different behavior in comparison with native samples. This is explained by the presence of flexible chains of magnetosomes in non-sonicated samples which have qualitative features of magnetic susceptibility predicted by the model of flexible magnetic rods. The next experiment describes how to study the heating response (magnetic hyperthermia) of magnetosomes added into a tissue-mimicking phantom on the applied alternating magnetic field. Temperature evolution and specific absorption rate (SAR) were measured and analyzed. It was found that placing of magnetosome chains in gel phantoms leads to a noticeable decrease in the efficiency of heating due to deterioration of Brown mechanism.

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**Matúš Molčan, PhD** received a PhD degree in Physics of Condensed Matter and Acoustics at Pavol Jozef Šafarik University in Košice, 2014. Since then he has been working as a young researcher at the Institute of Experimental Physics SAS, Košice. Molcan deals with the preparation and characterization of magnetic nanoparticles in the system of magnetic fluids and magnetosomes. He is also responsible for the Laboratory of Magnetic Hyperthermia at the Department of Magnetism, IEP.