Prof. Benoit P. PICHON

Institut de Physique et Chimie des Matériaux de Strasbourg (France)

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SEMINAR

«Design and Assembly Strategies of Magnetic Nanoparticules ».

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More information : Sophie HERMANS (sophie.hermans@uclouvain.be)
Damien Debecker (damien.debecker@uclouvain.be)
ABSTRACT

Benoit P. PICHON, Institut de Physique et Chimie des Matériaux de Strasbourg.

Owing to their size and shape dependent properties, magnetic nanoparticles are gaining increasing interest due to numerous applications in advanced fields such as permanent magnets, magnetic recording media, microwave adsorption, ferrofluids or biomedicine. The physical properties of nanoparticles being significantly dependent on size and shape as well as their direct environment, it is well argued that the key to successful applications of such nanoparticle-based devices is engineering well-defined nanostructures. In this context, our main interest in research deals with (1) the design of new types of nanoparticles with enhanced magnetic properties, and with (2) the development of new strategies to generate arrays of nanoparticles in an easy way in the field of the bottom-up approach.

Nanoparticle design is achieved with a high control on size distribution and shape of spheric and cubic nanoparticles. The mechanism pathways are also deeply investigated, in order to bring a better understanding of their magnetic properties and to synthesized multicomponent nanoparticles combining at least, two different phases in core-shell structure (FeO@Fe3O4, Fe3O4@CoO, Fe3O4@CoFe2O4, ...)

Different assembling strategies based on the chemical patterning of magnetic nanoparticles have been developed. The spatial arrangement of nanoparticles onto surfaces has been controlled as chains (1D), monolayer (2D), multilayer (3D) with tunable interparticle distances within and between layers. Different types of interactions (electrostatic, covalent, chelate, ...), interparticle interactions, and external stimuli (magnetic field, electric field, ...) are involved in these assembly processes. Finally, these strategies are versatile and can be applied to other types of nanoparticles, such as plasmonics. They also led to the integration of nanoparticle assemblies in devices, in order to explore their magneto resistive properties.

BIOGRAPHY

Benoit P. Pichon is associate professor at the University of Strasbourg (France). He studied Chemistry at the Universities of Caen and Rennes where he specialized in Organic Chemistry and obtained his degree in 2001. In 2004, he obtained is PhD from the University of Montpellier where he studied self-organization processes in hybrid silica under the supervision of Prof. Dr. J. J. E. Moreau. From 2005-2006, he earned a post-doc fellowship at the Eindhoven University of Technology where he worked on biomineralization processes of calcium carbonate directed by molecular self-assembly. Then, he turned on seed mediated growth of zinc oxide, in Montpellier.

Benoit Pichon moved to the University of Strasbourg where he was appointed assistant professor in 2006. He obtained his habilitation to supervise research and became associate professor in 2014. Author of 64 peer reviewed articles (h factor of 23 and >1 500 citations), he gave more than 50 lectures (17 invited Lectures in conferences). His scientific production involved the (co)supervision of 6 PhD students and 12 Master students. He is awarded by the Prime d’Excellence Scientifique (2011-2015 & 2015-2019) and by Prix les Espoirs de l’Université de Strasbourg in 2015. In 2016, a just became Junior Fellow at the Institut Universitaire de France (IUF)

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