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Plate-like nanomagnets for new advanced materials

Functionality of materials can be enriched by the anisotropy. Crystalline and/or shape anisotropy of materials results in orientationally dependent physical properties. For example, a class of materials, named hexaferrites, shows uniaxial magnetic anisotropy due to their anisotropic crystal structure of magnetoplumbite type. Hexaferrites crystallize in the shape of thin hexagonal platelets with a magnetic easy in the direction of the *c*-crystal axis, i.e., perpendicular to the basal crystal plane. Consequently, a single hexaferrite platelet forms a nanomagnet, with a direction dependent response to an applied magnetic field. In order to exploit the platelets' specific magnetic properties they should be synthesized in wet and used in the form of stable suspensions. Subsequently, plate-like nanomagnets can be: (i) embedded in different matrices to form composites, (ii) assembled from the suspensions into higher structures, films or bulk materials, or (iii) hybridized with functional organic moieties; all resulting in new advanced materials. In this contribution we present our original approach for the synthesis of hexaferrite plate-like nanomagnets, including the possibilities for tuning different interparticle forces that allowed for the development of self-biased thick films, new magneto-optic composites and ferromagnetic suspensions. A specific role of the magnetocrystalline and shape anisotropy of these nanomagnets for the realization of the new advanced material will be elucidated and their potential applications will be presented.

Biography

Darja Lisjak completed her PhD in 1999 at Faculty of Chemistry and Chemical Technology of University of Ljubljana. She was at Jožef Stefan Institute for most of her research time, a Visiting Researcher at University of Pennsylvania and University of Trieste, and a Senior Researcher at Center of Excellence COBIK. She is now a Senior Researcher at Department for Materials Synthesis at Jožef Stefan Institute and an Associated Professor at Jožef Stefan International Postgraduate School. She published more than 85 scientific papers and was awarded, together with Prof. Alenka Mertelj, a Zois recognition for the development of ferromagnetic suspensions.

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