

Séminaire LIONS



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Functional Magnets Assemblies: Biological design and Synthetic Approach

Damien Faivre

*Department of Biomaterials, Max Planck Institute of Colloids and Interfaces,
Potsdam*

Biom mineralization is the formation of biological materials by living organisms. Even very primary organisms such as bacteria are able to produce inorganics with superior properties than man-made materials to fulfill a given function. Magnetotactic bacteria are a paradigm of such simple cells forming magnetic nanoparticles with magnetosomes, organelles dedicated to biomineralization. The particles have biologically controlled ultrastructure, size, morphology, organization and orientation in order to align the cell with the Earth magnetic field lines for the search of particular oxygen conditions in aqueous environments.

We have studied the mechanism of magnetite formation and organization by such microorganisms with advanced synchrotron-based spectroscopic and microscopic techniques. We then compare these results with the reaction pathway we found for synthetic magnetite with cryo-electron microscopy. Finally, we present how biological additives can influence this reaction pathway, and how we can make use of such synthetic nanoparticles assembly for the design of magnetic nanoswimmers.