# Nanostructured magnetic matrix for the study of intracellular mechanisms of biomineralization

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In nature, magnetotactic bacteria synthesize intracellular mineral magnetic nanoparticles [1]. These nanoparticles surrounded by a membrane (magnetosomes) are produced in microoxic zone in presence of iron in environmental conditions. To understand the effect of magnetic field on the growth of magnetic biogenic nanoparticles, encapsulation of bacteria in a silica matrix has been performed. The bioencapsulation via sol-gel process permitted to prevent the move of bacteria along magnetic field lines and improved the viability of the cells over the long-term [2]. The silica gels were placed in a set-up to expose encapsulated bacteria to an external magnetic field (80 mT). To evaluate the cytocompatibility of the matrix, viability tests were performed using plate-count technique which gives the number of culturable bacteria and monitoring of metabolic activity. The viability tests were realized using bacteria without magnetosomes (*non magnetic cells*) and with magnetosomes (*magnetic cells*). After 7 days of encapsulation, 40 % of *non magnetic cells* and 30% of *magnetic cells* were still viable. The tests have shown that the viability of magnetic cells decreases more quickly than that of cells without magnetosomes. In order to evaluate the capacity of *non magnetic cells* to produce magnetosomes in presence or not of a magnetic field, the bacteria were encapsulated during 7 days. On the long term, the bacteria could produce magnetosomes in determined conditions (iron supply and low oxygen concentration). In this case, the presence of an external magnetic field had an effect the form or orientation of the biogenic nanoparticles and likely stimulated their production.

[1] Faivre & Schüler (2008) *Chem. Rev.* **11**, 4875–4898 [2] Blondeau & Coradin (2012) *J. Mater. Chem.* **22**, 22335-22343