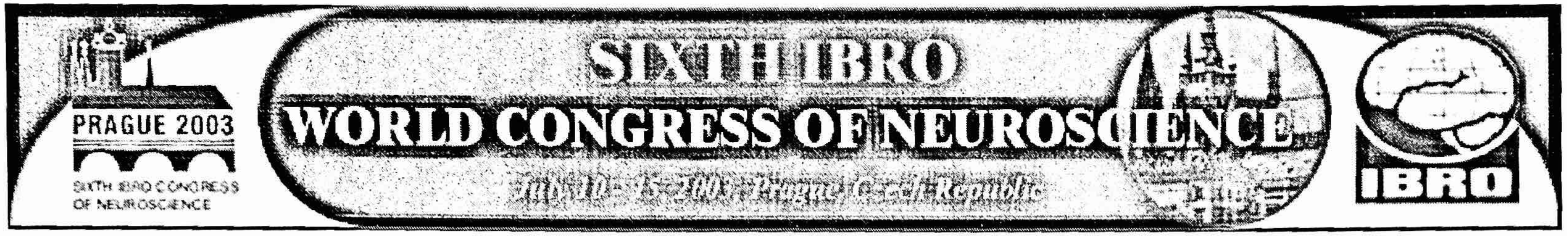

0480 RELAXOMETRY OF NANOMAGNETS SUSPENSIONS: THEORIES AND APPLICATIONS

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Magnetic nanocrystals are probably among the best candidates for the development of more specific and more efficient contrast agents for MRI allowing for very early diagnosis. Their potential is inherent to their particulate nature, which provides high relaxivities (increase of the solvent relaxation rate induced by a concentration of 1millimole per liter of active compound), and the ability to target several thousands of ferromagnetic iron ions to a specific receptor. The proton relaxation rate of a colloidal suspension of nanomagnets is not only governed by the crystal properties like its radius, its specific magnetization and its energy of anisotropy, but also by its state of agglomeration. We will give a phenomenological description of the various processes by which each of these parameters can influence the relaxometric behavior of the superparamagnetic colloid. These considerations allow to fix the limit of the existing models for the prediction of the efficiency of the nanomagnets as contrast agents. We will also show how Nuclear Magnetic Relaxation Dispersion (NMRD) profiles which give the evolution of the longitudinal relaxation rate (R1) of the solvent protons with the magnetic field can be used to determine most of the nanomagnet suspension parameters namely their average radius r, their specific magnetization Ms, their anisotropy energy Ea and the extent of their clustering. We can separate two types of effects arising from the aggregation of magnetic grains: on the one hand, those related to the global structure of the cluster and to the magnetic field distribution around them and, on the other hand, those limited to the inner part of the aggregate. While the former ones predominantly affect transverse relaxation rate R2, the latter ones govern R1.