# Nuclear resonant scattering of chemical and biological systems with focussed beams and high resolution monochromators

## V. Schünemann

### Departments of Physics, Technische Universität Kaiserslautern, 67663 Kaiserslautern, Germany **schuene@physik.uni-kl.de**

Nuclear resonance scattering techniques are ideal tools to investigate electronic and dynamic properties of iron centers in chemical and biological systems. In combination with quantum mechanical calculations for example, the iron ligand modes of NO transporter proteins [1] and the iron sulfur protein LytB [2] have been explored via Nuclear Inelastic Scattering (NIS). Even the influence of ligand protonation could be explored together with the Haumann group in e.g. dinuclear iron proteins [3]. First attempts to investigate iron protein single crystals have been promissing at ID 18 of ESRF [4] and are currently continued at PETRA III. In addition, Nuclear Forward Scattering (NFS) has been applied to monitor the spin switch between the S=0 and S=2 state of spin crossover microstructures [5]. In order to investigate the spin switching process in even more miniaturized corresponding nanostructures better focussing possibilities of the synchrotron beam are highly desirable. In my talk I will also address some more recent work and possible applications with neV monochromators and nanofocussed beams on polynuclear iron(II) spin crossover compounds, iron based catalysts as well as biological cells [6-11]. In addition, future applications to study iron containing single molecule magnets (SMMs) by means of NIS will be discussed on the basis of recent experiments at P01, PETRA III. In this respect also very recent investigations performed on dysprosium containing SMMs by means of 161Dy-NFS [12] are a promising basis to investigate spin phonon coupling in these SMMs which seem to be promising candidates for future molecule based spintronic devices.

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