





Istituto di Chimica dei Composti Organometallici

## ICCOM Pisa incontra ICCOM Firenze

Venerdì 11 Ottobre 2019 Alle ore 11:00

presso Aula 2 - Edificio F Area della Ricerca CNR, Via Madonna del Piano 10, Sesto Fiorentino

La Dr.ssa Silvia Pizzanelli di ICCOM-Pisa terrà il seguente seminario:

"Fast Field Cycling NMR: a low resolution technique for high-value information in materials studies"

> Dr. Francesco Vizza ICCOM-CNR

## Abstract:

Fast Field Cycling NMR relaxometry permits to measure nuclear spin relaxation times over a wide range of magnetic field strengths. Typically, the field strengths, expressed as proton Larmor frequencies, range from a few kHz up to 40 MHz, making FFC NMR a low field technique. Although FFC NMR lacks the resolution of high field NMR spectroscopy, it is superior for studies of molecular dynamics because it provides relaxation times at different field strengths using just one instrument. The low frequencies investigated render FFC NMR relaxometry particularly useful in revealing information on slow molecular dynamics, which is of interest for the characterization of many systems, such as polymers, liquid crystals, porous materials and contrast agents for MRI.

I will show two case studies demonstrating the type of information that can be obtained by FFC NMR relaxometry. The former will concern the trapping of Gd(III) ions by polyanionic nanocapsules in water, where equilibria between trapped and free ions dependent on the charge of the nanocapsule were revealed, a piece of information not accessible with other techniques.<sup>1</sup> In the latter study, the diffusion of water in the pores of a metal organic framework, NH<sub>2</sub>-MIL-125, was found to reflect the void structure of the adsorbent, constituted by spherical cavities and channels spanning a crystallite. Quadrupolar peaks characterizing the almost dry adsorbent gave insight into very slow molecular dynamics of the organic moieties of NH<sub>2</sub>-MIL-125.<sup>2</sup>

<sup>1</sup> Silvia Pizzanelli, Rustem Zairov, Maxim Sokolov, Marco Carlo Mascherpa, Bulat Akhmadeev, Asiya Mustafina, and Lucia Calucci, "Trapping of Gd(III) Ions by Keplerate Polyanionic Nanocapsules in Water: A
<sup>1</sup>H Fast Field Cycling NMR Relaxometry Study" J. Phys. Chem. C 2019, 123, 18095–18102.

<sup>2</sup> Silvia Pizzanelli, Angelo Freni, Larisa Gordeeva, and Claudia Forte, "Water adsorption on MOFs studied by NMR relaxometry" Proceedings of The Fifth International Symposium on Innovative Materials and Processes in Energy Systems, IMPRES2019, 20th - 23rd October, 2019, Kanazawa, Japan.

## **Biographic sketch:**

Silvia Pizzanelli is a researcher at ICCOM-CNR since 2014, working in the magnetic resonance laboratory of Pisa.

She graduated in Chemistry (110/110 cum laude) at the University of Pisa in 1998, discussing a thesis on chemical shift of binaphthyl-derivatives. She received her PhD in Chemical Sciences in 2001 at the University of Pisa with a thesis entitled "Dynamics of anisotropic systems by means of NMR". In 2003 she was a post-doc at Weizmann Institute of Science in Israel.



Her research is focused on the application of solid state NMR and relaxometry to condensed matter, including polymers, liquid crystals, porous materials, and contrast agents.

She currently cooperates with researchers in Italy, UK, and Russia. She has participated to some research projects (a COST action on relaxometry, a joint project CNR-Polish Academy of Sciences on glass, a Tuscany Region project on materials for buildings) and is co-author of 28 peer reviewed publications, 1 book on chemical physics (edited by ETS Pisa), 37 contributions to national and international conferences. She was a member of the organizing committee of an international conference on relaxometry held in 2019.