



Istituto di Chimica dei Composti Organometallici



UNIVERSITÀ
DI SIENA
1240



ICCOM Firenze incontra ICCOM Pisa

Venerdì 8 Luglio 2016

Alle ore 11:00

presso Aula 2 - Edificio F

Area della Ricerca CNR, Via Madonna del Piano 10 - Sesto F.no

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

“Solid State NMR and relaxometry for the investigation of innovative eco-sustainable cements”

Dr. Maurizio Peruzzini
Direttore ICCOM-CNR

Abstract:

In view of the increasing need of ecosustainability, the research on cement formulations alternative to traditional Portland ones is continuously growing, both for reducing the environmental impact due to the CO₂ emissions during production, and for developing suitable materials for specific applications, as for instance nuclear waste encapsulation. In this framework innovative MgO based cements are attracting many research efforts. Solid State NMR and relaxometry are extremely powerful methodologies for the detailed structural investigation of cements, being able to overcome the intrinsic difficulties related to the strong amorphous character and the large structural complexity typical of these materials. In this talk I will show the recent results obtained from a combined Solid State NMR and relaxometry study of MgO based and MgO/Portland mixed innovative cement materials. A detailed high-resolution Solid State NMR investigation, based on the observation of silicon-29, hydrogen-1 and aluminum-27, has allowed the most important structural features at “molecular” and nanometric level to be accessed and characterized, as a function of chemical composition and of the time of the hydration reaction responsible for the formation of the binding phases. On the other hand, the study of the relaxometric properties of hydrogen-1 nuclei, in particular spin-lattice relaxation times T₁ measured through Fast Field Cycling and ¹H T₂ measured at low magnetic field, has shed light onto the status of water in these matrices and its time evolution.



Biographic sketch:

Silvia Borsacchi is at present a fixed-term CNR researcher (RTD) at ICCOM in Pisa. She is responsible for a research unit of a MIUR funded Futuro in Ricerca 2013 project entitled "Advanced nanostructured materials for eco-sustainable cements: investigation of the structural properties and innovative strategies for their improvement" (April 2014-April 2017).

Education and career: 2003 Master Degree in Chemistry at the University of Pisa, 110/110 cum laude, with a thesis in physical chemistry on the use of lyotropic liquid crystals as solvents for NMR studies of the orientation and structure of solute molecules (supervisors Prof. C.A. Veracini and Dr. D. Catalano); 2004-2006 PhD School G. Galilei in Chemical Sciences of the University of Pisa; 2007 PhD in Chemical Sciences, thesis "Structure, dynamics and interfaces of organic-inorganic multicomponent materials by means of solid-state NMR spectroscopy", supervisors Prof. C.A. Veracini, Prof. R. Wasylshen; 2006 visiting researcher in the Prof. Wasylshen Solid State NMR (SSNMR) group (University of Alberta, Canada); 2007-2013 post-doc at Department of Chemistry and Industrial Chemistry of the University of Pisa and INSTM (Solid State NMR group of Prof. Marco Geppi) for SSNMR studies of organic-inorganic nanocomposites, materials for environmentally sustainable energy production, shape memory systems.

Research interests: Silvia Borsacchi carried out her research activity in physical-chemistry and materials science. She specialized in the characterization of the structural and dynamic properties of complex solid systems (polymers, nanocomposites, hybrids, materials for energy production, catalysts, etc.), on wide spatial (0.1-100 nm) and time (10 ps-100 s) scales by means of SSNMR (multi-nuclear high- and low-resolution experiments for spin-1/2 and quadrupolar nuclei). She has always worked in collaboration with research groups specialized in the preparation and characterization of materials, obtaining an advanced knowledge of them by relating the properties determined via SSNMR with the relevant chemical, functional and macroscopic properties of the materials. She also collaborated to SSNMR studies on drugs, biopolymers and soft matter, mainly focusing on the characterization of their crystallographic, phase and dynamic properties. She has taken part to the research activity of several national and international projects and she has worked in collaboration with several Italian and foreign industries. She is coauthor of about 100 contributions to national and international conferences, about 20 of them invited, and of 45 publications on international scientific journals and books.