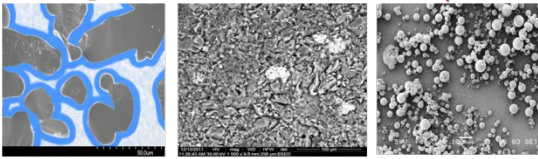
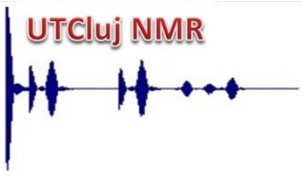




NUCLEAR MAGNETIC RESONANCE DIFFUSOMETRY AND RELAXOMETRY LABORATORY

Contact details

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| Name | Nuclear Magnetic Resonance Diffusometry and Relaxometry Laboratory |  |
| Acronym | NMRDR | |
| Logo |  |  |
| Site | http://nmr.utcluj.ro | |
| Address | 103-105 Blv. Muncii, room C001, Cluj-Napoca, Romania |  |
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Areas of expertise

In our laboratory we investigate via NMR diffusometry and relaxometry techniques the dynamics of liquid molecules at the interface of porous media and under confinement conditions. The porous media under study have nanometer or micrometer pore sizes and may be fully or partially saturated with fluids. The investigations are done at different temperatures and resonance frequencies. The porous systems currently under study are: porous glasses, polymeric nanocapsules used in controlled drug delivery, ultra strong concrete samples, porous ceramics with magnetic impurities, biomaterials with applications in medicine. Other materials of interest are: fuel cell membranes, lubricants, fuels, catalysts, zeolites, ionic liquids, liquid crystals, rubber. Using NMR relaxometry and diffusometry techniques in the investigation of fluids confined inside porous media it is possible to extract information about pores dimension and their connectivity. Other information that can be extracted refers to ageing and alteration processes of different materials such as rubber, polymers, lubricants or food. In our laboratory we are also interested in developing of new NMR techniques suitable for the investigation of systems with a high content of magnetic impurities (concrete, rocks, soils, different building materials).

Team

Prof. Dr. Ioan Ardelean, Assist. Prof. Dr. Codruța Badea, Andrea Bede, Calin Cadar, Roxana Erhan

Representative projects

“**NMR studies of molecular dynamics inside polymeric nanocapsules**”, Ceex Matnantech, (2006-2008)
 “**Obtaining and characterization of new target nano-medicines with naftochinonic active substance**”, PN2-NANOQMED (2007-2010)
 “**Molecular dynamics during the phase transition of liquids confined inside porous media**”, Alexander von Humboldt foundation (Joint research project), (2011-2014)
 “**Nuclear magnetic resonance studies of surface effects on dynamics of molecules confined inside porous media with magnetic impurities**”, PNII ID PCE, (2011-2016)

Significant results

The most representative publications of the past 5 years:

1. C. Badea, R.B. Mos, L. Ciontea, I. Ardelean, Low-Field Nuclear Magnetic Resonance Relaxometry as a Tool in Monitoring the Aging of Coating Solutions (Case Study: Barium Propionate Precursor Coating Solution), Appl. Magn. Reson. 39, 365-372 (2010).
2. R. Nechifor, M. Bogdan and I. Ardelean, The Size Distribution of Core Shell Polymeric Capsules as Revealed by Low-Field NMR Diffusometry, Appl. Magn. Reson. 40, 205-211 (2011).
3. M. Simina, R. Nechifor and I. Ardelean, Saturation-dependent nuclear magnetic resonance relaxation of fluids confined inside porous media with micrometer-sized pores, Magn. Reson. Chem. 49, 314-319 (2011).
4. R. Nechifor, C. Mattea, S. Stapf, M. Bogdan, I. Ardelean, NMR relaxation dispersion of Miglyol molecules confined inside polymeric micro-capsules, Magn. Reson. Chem. 49, 730-739 (2011).
5. M. Simina, L. Molnar, D. Manea and I. Ardelean, Monitoring the Air Influence on Cement–Lime Mortar Hydration Using Low-Field Nuclear Magnetic Resonance Relaxometry, Appl. Magn. Reson. 43, 443-450 (2012).
6. S. Muncaci and I. Ardelean, The Influence of the Magnetic Impurity Content on the Pore Size Distribution Determination via the DDIF Technique, Appl. Magn. Reson. 44, 365-373(2013).
7. S. Muncaci, C. Mattea, S. Stapf, I. Ardelean, Frequency-dependent NMR relaxation of liquids confined inside porous media containing an increased amount of magnetic impurities, Magn. Reson. Chem. 51, 123-128(2013).
8. S. Muncaci and I. Ardelean, Probing the Pore Size of Porous Ceramics with Controlled Amount of Magnetic Impurities via Diffusion Effects on the CPMG Technique, Appl. Magn. Reson. 44, 837-848 (2013).
9. A. Pop, C. Badea and I. Ardelean, The Effects of Different Superplasticizers and Water-to-Cement Ratios on the Hydration of Gray Cement Using T2-NMR, Appl. Magn. Reson. 44, 1223-1234 (2013).
10. S. Boboia, M. Moldovan, C. Prejmorean, C. Sarosi, A. Roman, I. Ardelean, Influence of Initiation System and Filler Ratio on the Properties of New Flowable Dental Composites, Materiale Plastice 52, 104-108 (2015).
11. A. Pop and I. Ardelean, Monitoring the size evolution of capillary pores in cement paste during the early hydration via diffusion in internal gradients, Cem. Conc. Res. 77, 76-81 (2015).
12. A. Pop, A. Bede, M. C. Dudescu, F. Popa, I. Ardelean, Monitoring the Influence of Aminosilane on Cement Hydration Via Low-field NMR Relaxometry, Appl. Magn. Reson. 47, 191-199 (2015).

The offer addressed to the economic environment

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|------------------------|---|
| Research & development | The NMR diffusometry and relaxometry laboratory provides a variety of measurements for characterization of materials. Between these a list of possible investigations is given bellow: <ul style="list-style-type: none"> - Study the effects of various additives on cement hydration; - Study the alteration and ageing of rubber or polymers as well as monitoring the polymerization processes; - Determination of liquid content in different porous materials (stone, wood, ceramics, catalysts, bricks, soil, etc.) and their pore size distribution; - Determining the degree of deterioration of lubricants; - Study the effectiveness of contrast agents used in magnetic resonance imaging with applications in medicine; - Determining the water content and its distribution in foods and seeds; - Determining the permeability of soils to certain pollutants; - 2D optical images with resolution of up to 1µm of various non-transparent materials. |
| Consulting | We provide consultancy services on NMR techniques and their applications in medicine, oil industry, study of pollutants transport in soils, pore size characterization, study of cement based materials, etc. |
| Training | Training of personal in the field of NMR diffusometry and relaxometry techniques and their applications |