AGH Research Offer

Scanner MRI

Technical description:

Research using the MR tomograph and the RCA spectrometer enable the development of theoretical and application works on the use of the Nuclear Magnetic Resonance (NMR) phenomenon and complementary methods in biomedicine, geophysics and geology, chemistry and material engineering to study porous systems. In particular, this concerns the imaging of diffusion of water molecules in the presence of heterogeneous magnetic field gradients using techniques such as DWI, DTI, BSD-DTI, as well as the study of proton populations (1H) in various porous systems in high and low magnetic fields using spin relaxometry techniques -net, T1 and spin-spin, T2.

We conduct a wide range of studies of the pore structure of rocks and other porous materials found in biology, medicine and material engineering. We specialize in NMR research in low magnetic field, as well as in very high gradient magnetic field. As part of our research, we analyze the porosity and permeability of materials, and we also conduct work in the field of imaging the pore space. We also deal with a comprehensive analysis of the diffusion of water molecules (we have international patents on the calibration of MR scanners in the presence of heterogeneous magnetic field gradients) and relaxation times T1, T2 (taking into account chemical and diffusion exchange processes, as well as in the presence of induced gradients). We have experience both with reservoir rocks (shales, sandstones, carbonates), as well as with other natural and synthetic porous materials with a wide range

of pore sizes (micropores < 2nm, mesopores 2-50 nm, macropores > 50 nm), such as hydrogels , zeolites and biological tissues

Trade name: Tomograph Magritek (24 MHz)

More details: /equipment/tomograf-mr/

Access type: External

Type of accreditation / certificate: Not applicable

Contact person: Krzyżak Artur

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Responsible body: Department of Energy Resources

Group / laboratory / team: Systemy Porowate/LaTiS - Laboratorium Tomografii i Spektroskopii Magnetycznego Rezonansu Jądrowego

Last update date: May 27, 2023, 3:20 p.m.

Year of commissioning: 2015

IDUB research areas:

(PRA 1) Sustainable energy technologies, renewable sources of energy, energy storage, and resource management. Design, production, application, synergy, and process integration
(PRA 4) Technical solutions: from fundamental research, through modelling and design, to prototypes. The application of mathematical, information technology, and electronics tools to macro-, micro-, and nanoscale problems
(PRA 7) Design, production, and testing of modern materials and the technologies of the future based on a multidisciplinary approach combining materials engineering with chemistry, physics, mathematics, and medicine

Research capabilities:

Conducting interdisciplinary, biomedical, geophysical and material research.

Development of MRI methods for biomedical research: diagnosis of the brain, myocardium, coronary vessels, parameterization of the state of cells in vitro and in vivo. Study of water dynamics in porous systems

Measurement capabilities:

Imaging the proton density of biological materials as well as the pore space of rocks or other porous materials (2D and 3D).
Diffusion Imaging (diffusion weighted imaging - DWI, diffusion tensor imaging - DTI, non-uniform diffusion tensor imaging - BSD-DTI).
Tractography - Visualization of neuronal tracts or other anisotropic systems.

Conditions for providing infrastructure:

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