10th Bologna Conference on Magnetic Resonance in Porous Media

Programme

12th - 16th September 2010
in Leipzig, Germany

10^{th} Bologna Conference on Magnetic Resonance in Porous Media (MRPM 10)

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Book of Abstracts

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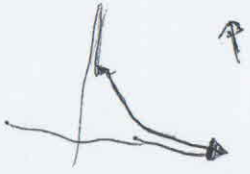

P105 Analysis of Spectral Influence of the NMR CWFP Parameters in Flow Quantitative Measurements

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The NMR-CWFP pulse sequence (Nuclear Magnetic Resonance - Continuous Wave Free Precession) has met several applications in the science. The present work analyses the high sensibility of this sequence to its spectral parameters variation, exclusively in a theoretical and experimental characterization of the flow NMR-CWFP of the kind plug-flow, exemplified by online measures by seeds transport through a mat under a magnetic field constant in time, with a small gradient.

Simulations and measurements were made on several conditions, varying the factors that have measurement influence, like flip angle, offset angle, time between pulses (T_p), gradient (G), velocity (v) and longitudinal and transversal relaxation times (T_1 and T_2). In a first hand, the theoretical results were made through a Bloch matrix approach, in an iterative algorithm, in each pulse interval. On the other hand, the experimental data were collected with a CAT 100 Tecmag Apollo hardware, in a Oxford 2.1 T magnet, with a offset phase of 5 MHz. In general, the samples were oil seeds, like linseeds, soybean and castor bean, exampling different T_1/T_2 rates. For driving the mat, a new software NMR Automation was done in a Visual Basic language, where space, velocity and acceleration could be controlled.

Under certain conditions of flip angle, precession, time between pulses, gradient and velocity, it was noticed that there might be a null point with T_1 and T_2 dependence. For example, in a low rate T_1/T_2, the null point was in a really low velocity, when for high rate T_1/T_2, high velocity is needed, and the signal showed constant for low velocity. Experimentally, just low velocity could be measured, but still could be seen influence of the velocity in the amplitude of the CWFP signal. The null point phenomenon was studied and a new selective method through relaxation times was suggested. The work validated also the CWFP pulse sequence as a quantitative tool to quantitative analysis of seeds oil mass, with a potential for more than thousand seeds in an hour interval. We thank the Brazilian researcher agencies CNPq and FAPESP.

P106 Slow Flow in Natural Porous Media Monitored by MRI

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Besides the gas phase, water is the universal transport medium for nutrients and contaminants in soils. The corresponding flow processes are characterised by slow flow velocities and sensitivity for external disturbances. Therefore MRI in combination with tracer is very convenient for non-invasive monitoring. Necessary is a tracer which behaves conservatively, e.g. it should not interact with