

10th Bologna Conference on Magnetic Resonance in Porous Media



Programme

12th - 16th September 2010
in Leipzig, Germany

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

12th to 16th September 2010
in Leipzig, Germany

Book of Abstracts

I16 High-Throughput Low Resolution NMR Methods to Analysis of Agri-Food Products

*Luiz Colnago*¹

¹ Embrapa (Brazilian Agricultural Research Corporation)

We have recently proposed a low resolution NMR method termed continuous wave-free precession (CWFP) to enhance signal-to-noise ratio in quantitative analysis, measuring flow, longitudinal (T_1) and transverse relaxation time (T_2) measurements in a single experiment, and thermal diffusivity measurements in a few seconds. We have been using this sequence for on-line and non-destructive measurements of agri-food products based on a low resolution NMR spectrometer. The on-line spectrometer is based on a CAT 100 NMR transceiver, Tecmag, a 30 cm bore, 2.1 T superconducting Oxford magnet and in a homemade polycarbonate conveyor belt, driven by a Parker step motor.

The CWFP regime is attained when a train of short pulses, with period T_p small as compared to T_2^* is applied to a liquid or heterogeneous sample. This causes the amplitude of the transverse magnetization just preceding pulse to be equal to the amplitude following the pulse. Since the condition $T_p < T_2^*$ implies that dephasing of isochromats in each interval T_p is relatively small, a continuous wave periodic signal with practically constant amplitude, displaying n nodes within each T_p interval, is obtained. Therefore, the CWFP signal can be observed continuously for arbitrary long periods of time while a stream of samples is conveyed to the NMR receive/transmit coil. The CWFP sequence has the potential to measure the oil content in more than 20.000 samples per hour or to measure the intramuscular fat content in more than 500 beef portions/hour.

Using the same on-line spectrometer and CPMG pulse sequence we have been measuring the oil quality in intact seeds. The CPMG decay processed by chemometric methods was able to determine the oil quality in intact seeds by its fatty composition, cetane number, iodine value and kinematic viscosity with a correlation coefficient $r > 0.9$. The automated NMR system has the potential to analyze more than 1000 samples per hour. The CPMG sequence has also been used to detected mechanical injuries in fruits such as banana, pears.

I17 Characterisation of Heterogeneous System by PFG-NMR

*Geir Sørland*¹

¹ Anvendt Teknol AS, Trondheim, Norway

In heterogeneous media, as food stuff or rock cores saturated with crude oil and/or brine, the use of pulsed field gradients is an essential for resolving the NMR response from the different components. In addition one may use the diffusion measurements themselves to extract information about the environment in which the diffusing molecules are confined.

Ever since Mitra et al. (Physical Review B 47 (1993)) introduced the short observation time expansion of the observed diffusion coefficient, resolving the