APPLICATION DEVELOPMENT FOR MQ20 NUCLEAR MAGNETIC RESONANCE (NMR) MEASUREMENTS USING EXPSPEL EXPERIMENT EDITOR

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Solid fat content (SFC) determination is of prime importance in food processing and product development of fats and fat-based products as their melting profiles need to be characterised. Pulsed Nuclear Magnetic Resonance (pNMR) is widely used for the measurement of SFC in oils and fats determination by TD-NMR (Time-Domain NMR) has long been recognised as a standard for SFC measurements.

pNMR Using the Minispec

SFC is determined by simultaneously detecting the NMR signal from excited hydrogen atoms in the fat sample. As the hydrogen signals from the liquid and the solid fractions are different, SFC – as a function of sample temperature – can be obtained directly. The minispec employs the 'pulse' method to perform SFC measurements. A short radio frequency (RF) pulse is applied to the sample in a static magnetic field to cause excitation of the hydrogen atoms in the fat (*Figure 1*).

MPOB possesses a Bruker Minispec mq20 pNMR analyser together with the ExpSpel Experiment Editor software which is capable of handling complex pulse sequences and performing mathematical data processing. The ExpSpel Experimental Editor enables the user to develop new application protocols, such as programming pulse sequences, controlling data acquisition and peripherals, performing mathematical operations (calibration and correlation curves, curve-fitting), and customising output results. Thus, the software can be used for customised applications related to the analyses of palm oil and its products, palm-based products and other vegetable oils. This software facility is now available for use by researchers from MPOB, the palm oil industry, universities and other organisations.

Example of an Application Using the ExpSpel Experiment Editor – SFC Monitoring during Isothermal Crystallisation

Figure 2 shows the results of the application of the software for monitoring isothermal SFC in samples during crystallisation at various temperatures.
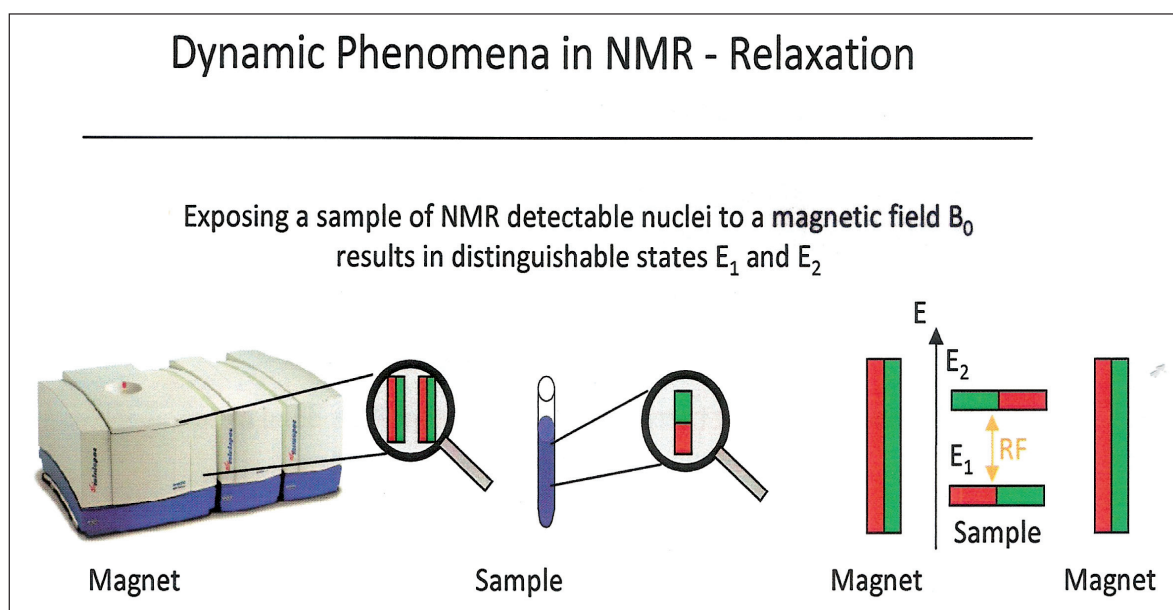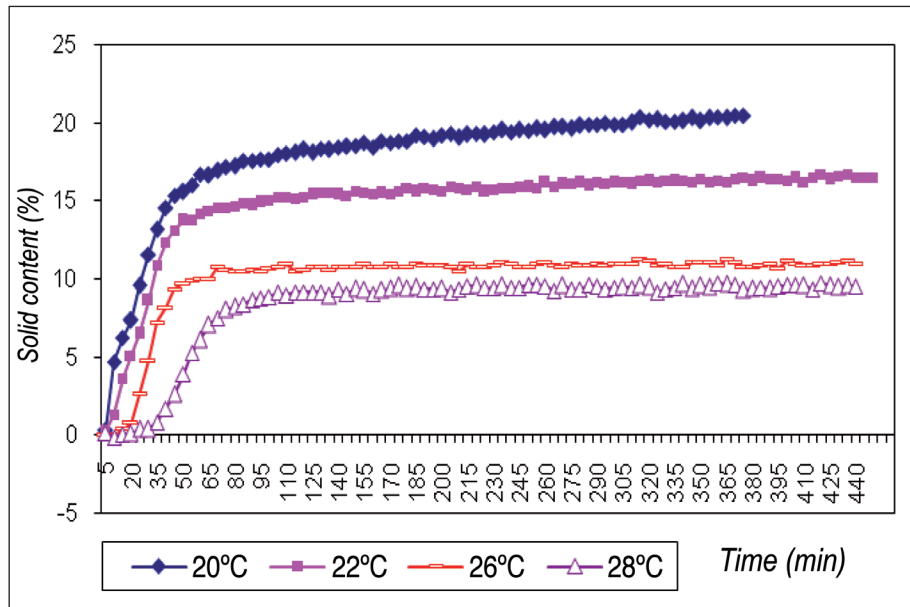

Figure 1. The minispec mq20 NMR analyser.

Figure 2. Effects of 1% of THL-17 additive on the isothermal crystallisation of palm oil.

SERVICES OFFERED

- Application of the ExpSpel Experiment Editor software (process programming) for monitoring SFC during isothermal crystallisation.
- Application of the ExpSpel Experiment Editor software (process programming) for monitoring SFC using temperature ramping during crystallisation and melting.
- Development of other applications.

COST

Depends on the type of services required.

CLIENTS

Palm oil industry R&D scientists, MPOB officers and university researchers (national and international).

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