



Determination of Total Fat Content (TFC) in Solid Food Products by Spin Track NMR Analyzer

GENERAL NOTES

Determination of total fat content (TFC) is very important in food industry because fat is the essential life component and its content is one of main indicators of food quality. Traditional chemical methods of TFC estimation have relatively low accuracy and reproducibility because they are based on solvent extraction which is time consuming, uses harmful reagents and solvents and the results depend on effectiveness of solvent extractability and personnel knowledge and experience. Noninvasive NMR looks as really easy and exact alternative method to determine TFC.

BASICS OF THE METHOD

Time-Domain NMR (TD-NMR) is a fast and accurate technique for determination of the total fat content. It is nondestructive, easily adaptable to on-line measurement and does not require additional chemical reagents. TD-NMR can be used to analyze most food products along the production process from the raw material until the finished product.

Resonance Systems offers its own developed revolutionary application that is the simplest among other analytical TFC techniques and requires no sample weighting.

Alternatively, customers can order the hardware configuration that can realize the AOAC Official Method TD-NMR method.

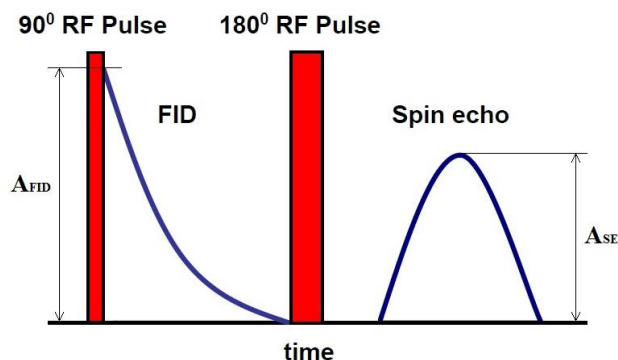


Fig.1. FID-Spin Echo sequence

Measurements are based on separation (fig.1) of the slow relaxing component of fats (that is previously melted by the proper sample conditioning) which is marked as A_{SE} and the fast relaxing signal of the complete sample matrix A_{FID} . The measured TFC value is directly proportional to the ratio A_{SE}/A_{FID} .

INSTRUMENTATION

NMR analyzer **Spin Track** (fig.2) from Resonance Systems is an ideal instrument for determination of total fat content because of short probe ringing time, high acquisition rate and high signal to noise ratio which make measurements very reproducible and accurate.

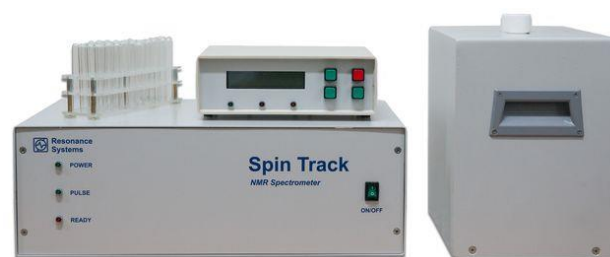


Fig.2. Spin Track NMR Analyzer

Spin Track is built utilizing up-to-date electronics and sophisticated signal processing, it is very simple to use because all measurements are made automatically by pressing one button or inserting sample. **Spin Track** is able to be configured for remote control across via the Internet. The process can be organized as operator-free by using autosampler.

The **Total Fat Content Analyzer** package comprises:

- Spin Track NMR Analyzer with thermally stabilized magnetic system (induction 0.4 - 0.5 T with gap for 10 or 18 mm test tubes);
- PC with pre-installed Microsoft OS © Windows 7, 8 or 10* and Relax 8 software;
- Thermostat "ST-80";
- Test tubes with outer diameter 10 or 18 mm**;
- Plastic caps for test tubes;
- Installation Manual;
- Method Sheet;



- Calibration/Validation samples;
- Autosampler (optionally).

* Determined by the PC manufacturer

** Depends on investigated samples

Precision balance and additional software package is included for AOAC compliance configuration.

CALIBRATION AND MEASUREMENT

The workflow consists of the following steps:

1. Filling sample tube;
2. Conditioning at 80 °C for 15 minutes;
3. Inserting sample tube in a detector manually or by the autosampler;
4. Running a measurement which is taking few seconds;
5. All measurement results are recorded in a spreadsheet, saved and can be accessed both on a computer and on-line.

No weighing is required since the ratio of liquid protons to total protons is measured.

Four calibration/validation samples are supplied.

Measurement results obtained with the Spin Track analyzer are shown below (fig.3).

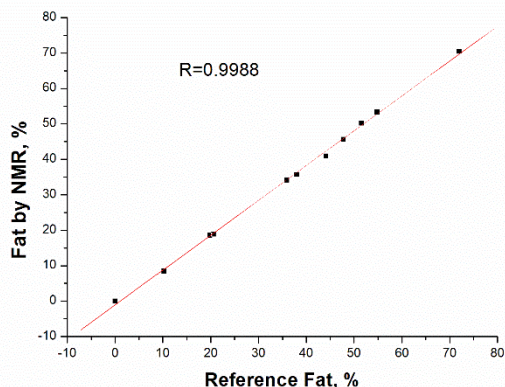


Fig.3. The results of measurements of total fat content

FEATURES AND BENEFITS

Main advantages of Spin Track TD-NMR analyzer:

- Fast measurement with high results accuracy;
- Requires no weighting of samples;
- Minimal reagents costs and reduction in the number of operations performed by staff;

- Same results of total fat content at varying air humidity;
- Process can be fully automated;
- Technical support

As it is mentioned before, the **Spin Track** fulfills the requirements of the international standard like AOAC Official Method 2008.06 (Moisture and Fat in Meats. Microwave and Nuclear Magnetic Resonance Analysis) revised in 2013.

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Please refer to additional information on the website of Resonance Systems www.nmr-design.com

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