



● the **minispec** Solid Fat Content Analyzers

The International Standard for Determination of Fat Melting Profiles

Solid Fat Content Analysis

- Official International Standard Methods
AOCS Cd 16b-93
ISO 8292
IUPAC 2.150
- Automated calibration with certified calibration standards
- No chemical pre-treatment of samples, non-destructive measurements
- Excellent reproducibility
- Dedicated SFC software
- Upgrade to full SFC automation, variable temperature and droplet size measurement capabilities

Solid Fat Content

Solid Fat Content (SFC) determination is of prime importance for food processing and development. Raw materials like fat compositions or blends need to be characterized and quality controlled according to their melting profiles. The SFC determination by TD-NMR (time-domain NMR) has become a recognized standard many years ago. Bruker's bench-top TD-NMR minispec SFC Analyzer is the result of our dedication since decades in the field of QA/QC applications. An SFC value is determined by detecting the NMR signal from both liquid and solid components in the fat sample simultaneously. Since the signals from the liquid and the solid parts differ, the SFC as a function of sample temperature can be obtained directly.

SFC Calibration Samples

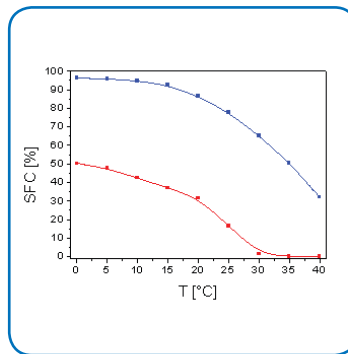
The Bruker minispec comes already pre-calibrated, ready-to-use together with Bruker's certified SFC standards, thus a complete solution is provided. Moreover, the standard samples are accompanied by an ISO certificate, proving correct results. The Daily Check procedure tests the equipment to ensure proper system performance. The same procedure automatically requests its execution after 24h and checks the equipment by means of the 3 Bruker SFC standards. Bruker also provides a cost-effective recalibration service for the SFC calibration standards.



Simple & Reliable:
SFC result made easy with the dedicated minispec Plus software (mq-one SFC Analyzer).



Precise & Traceable:
Bruker's unique set of SFC Calibration Standards.



Fast & Reproducible:
SFC melting curves obtained timely everywhere and by everybody.

Official SFC Methods

No other analytical method for SFC determination is conform to International Standards. The first official International Standard method for SFC was already introduced in the mid-seventies. At that time the first version of an IUPAC official method was launched. Since then the SFC method started to be used in all major laboratories dealing with fat compositions all over the world. The revised IUPAC method 2.150 was introduced in 1987, followed by the European ISO 8292 only few years later in 1991.

Finally the US market was specifically addressed by several AOCS methods, starting in 1993 with AOCS method Cd 16b-93 which was revised in 1999 and more official methods dealing with the indirect SFC determination.

Direct versus Indirect Measurements

Two official methods exist for measuring SFCs: the direct & the indirect method. The direct method measures the signal from both the solid and liquid components; the indirect method measures only the signal from the liquid and compares it to the signal from a fully melted sample. Practically more than 90% of the SFC customers run the direct SFC approach, due to its simplicity and reproducibility.

Direct Method

- Very fast and reproducible
- Requires minimal sample preparation
- F-Factor as determined by the Bruker set of SFC calibration samples

Indirect Method

- Measures fat at temperature of interest and in melted state
- In addition measure pure oil at the same temperatures as fat composition
- Calculation of Solid Fat Content by dedicated software for indirect method

Serial / Parallel Tempering Methods

Two different tempering sequences are used to condition the fat samples. If the quantity of sample is limited, then it is necessary to follow the serial method, otherwise the faster parallel method is used.

Customer Tailored SFC Applications

While the minispec SFC Analyzers are compliant to the official methods, they can certainly be adapted to customized SFC methods (quick methods) or even the so-called solid-echo measurement. The minispec software fully supports such approaches, by providing a very flexible software interface.

the minispec SFC Analyzers

mq-one SFC Analyzer (Package)

- Dedicated SFC Analyzer
- minispec Plus Software integral part of the package
- Bruker SFC Calibration Standards included
- One package of 10 mm Ø sample tubes in the package

the minispec mq20 Field-Upgradeable SFC Analyzer

- Full SFC Analyzer capabilities
- Offers future expansion options for
 - Oil Droplet Size Analysis
 - Water Droplet Size Analysis
 - Total Fat / Oil and Moisture in Food and Feed

the minispec mq20 SFC/Food Analyzer

- Full SFC Analyzer capabilities
- Full Total Fat / Oil and Moisture in Food and Feed capabilities by additional probe for 18 mm Ø sample tubes
- Offers future expansion options for
 - Oil Droplet Size Analysis
 - Water Droplet Size Analysis

the minispec mq20 Water Droplet Size and SFC Analyzer

- Full SFC Analyzer capabilities
- Water Droplet Size Application in water in oil emulsions, like margarine, diet spreads, butter etc. All required software and hardware included.
- Offers future expansion options for
 - Oil Droplet Size Analysis
 - Total Fat / Oil and Moisture in Food and Feed

All mq20 systems can alternatively be equipped with variable temperature probes; temperature range typically -5 °C ... +65 °C for R&D oriented SFC analysis.

SFC Automation Option

Please discuss your automation request with your Bruker office. A customer-tailored solution can be recommended.

Bruker BioSpin
is ISO 9001 certified.

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Solid Fat Content (SFC) Analysis

- The International Standard Method for the Determination of Fat Melting Profiles
Application #1

Solid Fat Content (SFC) determination is of prime importance for food processing and development. Raw materials like fat compositions or blends need to be characterized and controlled according to their melting profiles. The SFC determination by time domain (TD) NMR analysis is the internationally recognized standard method. In a close partnership with the oil & fat industry spanning more than 4 decades Bruker has developed its dedicated Bruker SFC Analyzer. All types of SFC methods are supported by the Bruker minispec, including direct/indirect and parallel/serial methods. The TD-NMR analysis provides a quick, non-destructive and solvent-free measurement. Bruker also offers a fully automated solution including tempering procedures, NMR measurement, and determination of the SFC value plus presentation of the melting curve.

Over the past 3 decades TD-NMR has substituted dilatometry in Quality Control due to its speed, simplicity, superior repeatable and reproducible values.

Bruker's TD-NMR analysis complies with the following international standard methods:

- AOCS Cd 16b-93
- AOCS Cd 16-81
- ISO 8292
- IUPAC 2.150

Features and Benefits

- Pre-calibrated instrument
- Bruker-certified calibration standards
- Automation Option for complete SFC procedure including all tempering steps
- Dedicated SFC software
- No chemical preparation needed
- Operator-independent

Direct/Indirect method

There are currently two official methods (in existence) for the measurement of SFC:

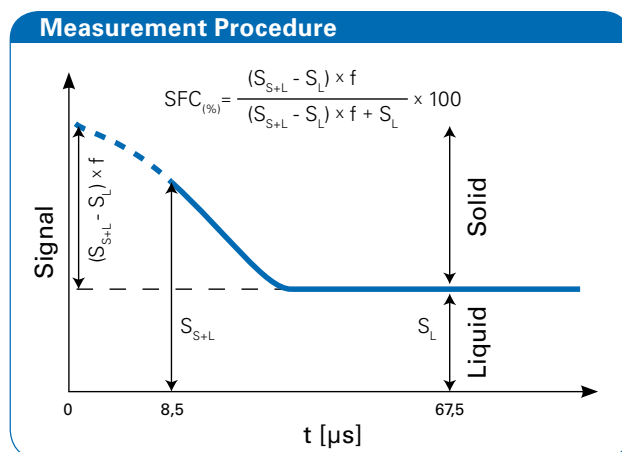
The direct method measures the signal of both the solid and liquid components of fats and is usually favored due to its speed and simplicity. The indirect method only obtains the signal from the liquid component and compares it to the signal of a fully melted sample. Both methods are supported by the Bruker SFC Analyzer.

Parallel/Serial tempering methods

In using the faster parallel method, many sample tube measurement temperatures containing the same fat are processed alongside each other. With the serial method, only one sample tube is necessary, which is tempered and measured at each thermal reading. In the industry, mostly the direct/parallel method is mostly used. The indirect method also plays an important role, especially in fat research & development.

The direct Method

The TD-NMR analysis is based on the fact that the signal from the solid component decays very quickly, whereas the signal from the liquid component is preserved significantly longer. The SFC value is defined as the ratio of the signal from the solid component divided by the total NMR signal. To account for the receiver dead time, the signal is extrapolated to $t = 0$ by multiplying with a correction factor called f-factor.



Instrument Validation

- Certified calibration samples are provided with the system. Typical values are 0, approximately 30 and approximately 70 %.
- Daily Check Procedure: standards are measured once daily and the system is validated automatically

The Bruker reference standards have originally been developed in cooperation with Unilever Research, The Netherlands. These days they are recognized as an industry standard and are the basis for inter-laboratory comparisons of SFC values.

This general calibration allows measurements of a wide range of fat compositions regardless of their chemical composition or fatty acid profile.



Recommended Equipment / Automation

- mq-one SFC Analyzer for routine QC
- mq20 series minispec for multiple applications, e.g. droplet size analysis or fat and moisture content in food
- SFC dedicated automation available for mq-one and mq20 series instruments
- Dedicated SFC software in combination with automation or for manual operation

