



# the minispec

- QC and R&D in the Chocolate Field

## Key minispec TD-NMR Applications:

- Solid Fat Content Analysis (SFC) in Fat Compositions (ISO, AOCS, IUPAC International Standard Methods)
- Solid Fat Content Analysis (SFC) in Chocolate Products
- Total Fat Content in Chocolate
- Total Fat Content in Cacao Powder
- Total Fat Content in Chocolate Liquor
- Total Fat Content in Cacao Beans

## R&D Applications:

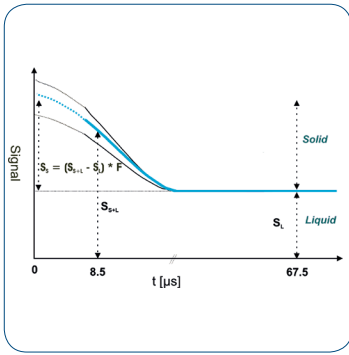
- Droplet Size Analysis in Emulsions
- 1D Profiling of Chocolate Samples, like for investigation of fat migration and bloom
- Investigation of Fat Crystal Structures

## The benefits of Bruker's minispec System

For many years the Bruker minispec has been well-known in the Fat and Chocolate industries for a precise and reliable determination of fat melting profiles on basis of the Solid Fat Content (SFC) Determination, an essential protocol to guarantee the desired fat properties. The SFC method is not just an application of TD-NMR, but is a well-established and recognized International Standard method. Besides the wide-spread so-called direct SFC methodology, the minispec can also run indirect and/or Solid Echo methods.

Reliable and precise determination of the Total Fat content in chocolate samples is equally important. The minispec offers a turn-key method combined with simple calibration. TD-NMR can use pure cocoa butter for fat content calibration. Alternatively a number of 3-5 real chocolate samples can be used for instrument calibration.

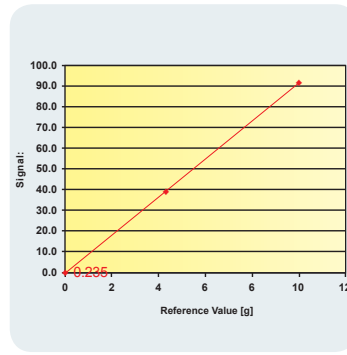
Total Fat determination can readily be applied to chocolate liquors and intermediate products featuring iron content. This is possible with Bruker's proprietary solution which takes into account the influence of the iron on the TD-NMR signals. Calibration can be done in as little as two minutes.



SFC Determination by direct SFC Method. Solid and Liquid parts clearly exhibit different relaxation behaviour. Due to dipolar coupling the solid fraction decays very quickly.



Bruker SFC Calibration Standards for a pre-calibrated minispec SFC analyzer. The samples are delivered together with a certificate, which is valid for 2 years.



Calibration Curve for analysis of total fat in chocolate samples. Different amounts of pure cocoa butter can be used to calibrate the minispec system.

Recently, SFC determination in chocolates has gained great interest throughout the world. Based on our TD-NMR minispec method, key customers have already successfully introduced this calibration-free method. This new approach is based on the so-called indirect SFC method as the solid fraction of the sample contains more than just fat.

### Applications in Research and Development

Studies on the crystallization behaviour of fats like triglyceride blends can be conducted with the non-destructive TD-NMR relaxometry approach. TD-NMR provides information otherwise only accessible by X-ray technologies.

MRI-like TD-NMR gradient experiments are widely used and can be applied to certain applications in the chocolate field.

- Droplet Size Distributions in water in oil as well as oil in water emulsions can be accessed by minispec Pulsed Field Gradient sequences.
- 1-dimensional gradients have been used to acquire sample profiles, for instance to study fat migration / bloom.

### Simple Calibration of the minispec:

QC Applications	
Solid Fat Content in Fat Composition	Calibration Samples are provided by Bruker with certificate
Solid Fat Content in Chocolate	calibration-free
Total Fat Content in Chocolate	Calibration with pure cocoa butter
Total Fat Content in Cacao Powder	Calibration with pure cocoa butter
Total Fat Content in Chocolate Liquor	Pure cocoa butter plus 5 liquor samples with known fat content
Total Fat Content in Cacao Beans	Calibration with pure cocoa butter
R&D Applications	
Water Dropelt Size Method	calibration-free
Oil Dropelt Size Method	calibration-free
1d - Profiling in x or y direction	calibration-free
Fat Crystal Structure	calibration-free

### Key Advantages of the minispec

- Compliant to International Standard Methods
- Calibration-free respectively simple calibration
- Samples are measured as-is, no sample preparation
- Integral TD-NMR measurement even in case of inhomogenous samples or if fat migrates / separates
- Full screening of the sample, not only the surface is analysed, but each hydrogen nuclei also inside the sample
- Fast Analysis, takes only few seconds
- Turn-key Method, easy-to-learn and use
- Non-destructive approach
- Operator requires no special skills
- Easy and intuitive minispec software
- A variety of NMR probes is available to suit exactly customers needs
- Long-term reliable and problem-free operation