Dip on Fibers
Elastomer Coating on Fibers

● Fast and Reliable Quality Control | Application #14

For special fiber applications, an elastomer coating, so-called dip, is necessary to improve the fiber's properties such as wind stopping, water repellent, and reinforcement. Such additional properties also qualify the fibers for technical use, for example, for clothing and for rubber products like car tires or conveyor belts. Using the minispec, the dip amount on fibers can be quickly and accurately analyzed in a one-step measurement.

Applicable Material

- Technical, textile and high performance fibers
- Multifilament or monofilament fibers
- Polyester, polyamide, polypropylene, polyethylene, polyacrylonitrile fibers

Features and Benefits

- Very few calibration standards necessary (3–5)
- Independent from sample color or surface
- One step measurement in < 60 sec guaranteed
- High reproducibility given, due to excellent magnet and magnet temperature stability

Innovation with Integrity

TD-NMR

Application Method

The application dip on fibers is based on different relaxation times of the dip and fiber. Measuring the decay of the time-domain (TD) NMR signal of the coated fiber, the dip signal is well-separated from the fiber signal and its amplitude correlates with the dip amount.
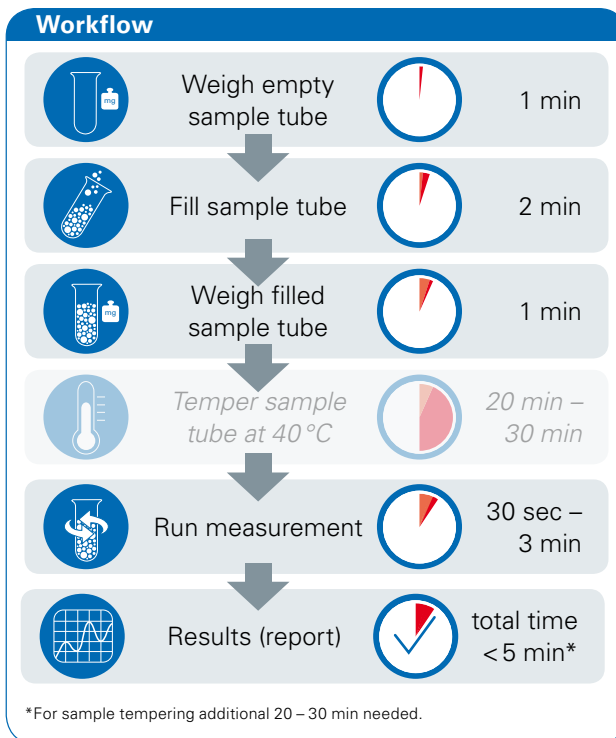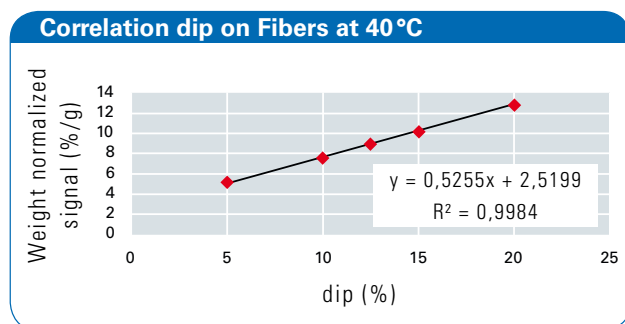
Note: The method requires the weight of the fiber sample. Make sure not to exceed the tube filling height. The average sample mass depends on the kind of textile and the detection limit on the amount of dip measured.

Calibration

The dip amount typically ranges from 5 up to 25 wt%, depending on fibers, coatings and applications. The calibration is usually performed by using known reference values from gravimetry or other methods. In some cases, alternative calibrations for respective dip and eventually for respective fibers are necessary.
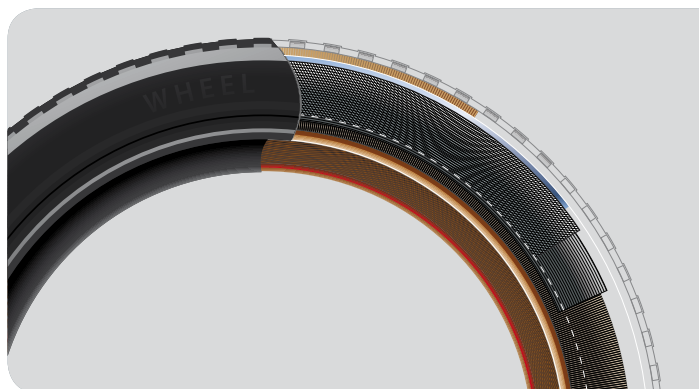
Application Example

For analyzing the dip on nylon fibers, 5 samples of known dip contents were measured for calibration. For each sample two replicates were prepared. The 18 mm sample tubes of the minispec mq20 Spin Finish Analyzer were filled with approximately 5 g of the sample and were tempered at 40°C prior to measurements. The reference values were determined using gravimetry. The comparison between TD-NMR and gravimetry is remarkable: the results are almost equal to the reference values, see figure below.

Workflow

Step	Time
Weigh empty sample tube	1 min
Fill sample tube	2 min
Weigh filled sample tube	1 min
Temper sample tube at 40 °C	*20 min – 30 min*
Run measurement	30 sec – 3 min
Results (report)	total time < 5 min*

*For sample tempering additional 20 – 30 min needed.

Recommended Equipment

- minispec mq-one Spin Finish Analyzer for routine
- minispec mq20 for R&D and routine
- Multilingual m+ software with fully traceable data
- Glass or TEFLON® tubes
- Balance with automatic weight transfer to minispec software
- Metal block thermostat for sample pre-tempering (optional)

Correlation dip on Fibers at 40 °C

Weight normalized signal (%/g) vs dip (%)

$$y = 0{,}5255x + 2{,}5199$$
$$R^2 = 0{,}9984$$

● **Bruker BioSpin**

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