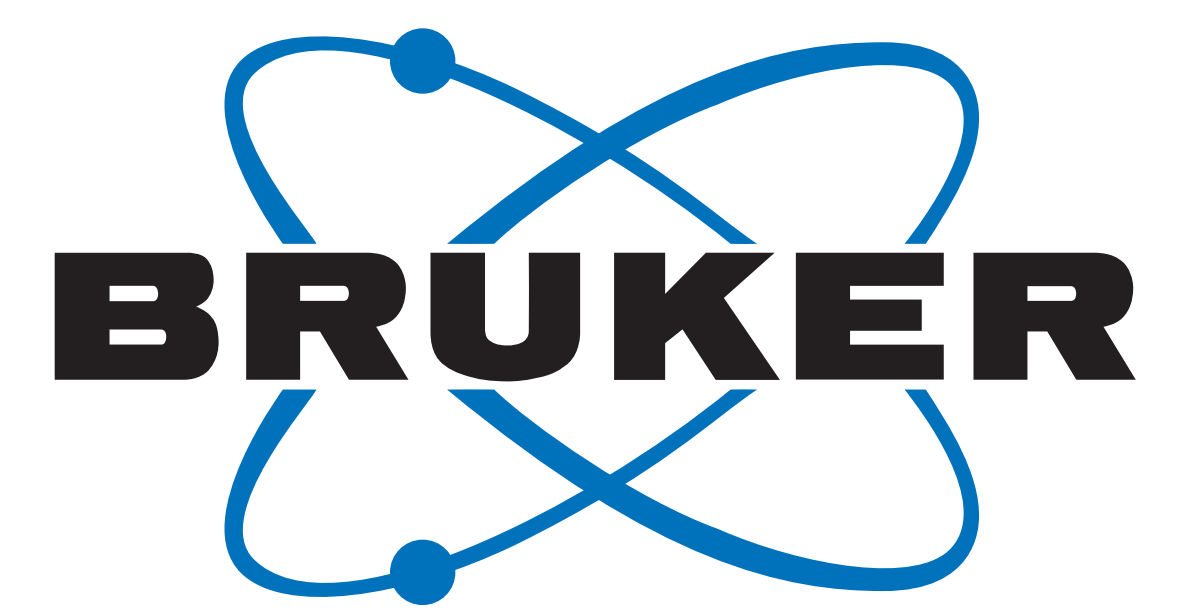


Bruker's Room Temperature Solid-State NMR Probe Portfolio and New Developments



Bruker's solid-state NMR probe portfolio showcases a commitment to innovation. It includes efficient CPMAS probes for standard analyses, along with specialized probes for battery and catalyst material research, high-temperature studies, and static solid-state NMR experiments. The renowned MAS 3 unit and a high-quality consumables portfolio further complement this comprehensive offering, ensuring researchers have the essential tools for cutting-edge solid-state NMR spectroscopy.

CPMAS and HRMAS Probes

Cross-Polarization Magic Angle Spinning (CPMAS) probes are ideal for the analysis of a wide range of biological and materials samples, such as proteins, polymers, battery materials or catalysts. Bruker offers a large variety of different CPMAS probe families (**H/X, H/X Low Gamma, H/C/N, H/C/N Low-E, H/F/X and H/X/Y**), guaranteeing optimum performance for each nucleus. Probes for MAS spinning speeds up to 160 kHz are available (see Table 1). Bruker's newest CPMAS probes (Figure 1) capitalize on the renowned iProbe platform. Each CPMAS iProbe is equipped with motors for automatic tuning, matching, and adjustment of the magic angle. Algorithms for tuning and matching, for the adjustment of the magic angle as well as for automatic shimming have been included in Bruker's TopSpin software and enable both remote operation and full automation of solid-state NMR experiments.

CPMAS iProbes are compatible with Bruker's MAS Shuttle (Figure 2), which transfers the NMR rotor with the sample substance into the stator inside the CPMAS iProbe. In combination with a sample case, this facilitates fully automatic and remote sample changes.

High Resolution Magic Angle Spinning (HRMAS) is the ideal technique to investigate many important classes of samples, such as gels, emulsions, foodstuffs, or biological tissues. With standard solution-state NMR techniques, the spectra of such samples would suffer from broad and unresolved resonances. By spinning at the magic angle, line broadening effects are removed, enhancing spectral resolution. Bruker's HRMAS iProbes are equipped with a gradient coil and a deuterium lock channel. The gradient makes a wide variety of NMR techniques accessible, including gradient enhanced solvent suppression and artefact-free homonuclear and heteronuclear 2D experiments.



Fig 1: Bruker CPMAS iProbe



Fig 2: Bruker MAS Shuttle

Max. MAS Speed [kHz]	Rotor Diameter [mm]	Rotor Volume [μ l]
7	7	360
15	4	106
24	3.2	47
42	1.9	13
67	1.3	3
111	0.7	0.6
160	0.4	0.12

Table 1: Available rotor diameters and spinning speeds for CPMAS

MAS 3 Magic Angle Spinning Unit

Bruker's MAS 3 magic angle spinning unit is known for its seamless integration into Bruker's spectrometer environment.

Depending on which type of probe is connected to the spectrometer, the correct drive and bearing pressure profiles are automatically selected to ensure smooth spin-up and stable rotation. The MAS 3 unit is used for CPMAS, HRMAS, and MAS CryoProbes.



Fig. 3 MAS 3 Magic Angle Spinning Unit

Specialty Solid-State Probes

In addition to the well-defined standard probe portfolio, Bruker offers a range of tailored solutions for special solid-state applications such as battery research, investigations of catalyst materials, static solid-state NMR or for NMR experiments at particularly high or low temperature. As an example, Figure 4 shows a Bruker MASCAT probe to elucidate catalyst behavior under reactive gas exposure and variable temperatures of up to 400 °C. The probe operates with special 7 mm MAS rotors.

As another example, Figure 5 shows a Bruker probe for static solid-state NMR. The samples are inserted into a cavity in the probe which is perpendicular to the magnet's B₀ field. Compared to Magic Angle Spinning (MAS) probes, static solid-state probes have a larger sample volume and longer RF coils, which both contribute to enhanced sensitivity.



Fig 4: Bruker MASCAT Probes



Fig 5: Bruker SB Static Probes

Solid-State NMR Product Portfolio

Bruker offers an extensive portfolio of NMR probes, accessories and consumables for solid-state NMR spectroscopy:

- CPMAS (both RT probes and MAS CryoProbes)
- HRMAS
- Probes for battery research (together with ePROBE GmbH)
- MASCAT
- LaserMAS
- Static Solid-State NMR
- DNP and LTMAS
- Accessories and Consumables