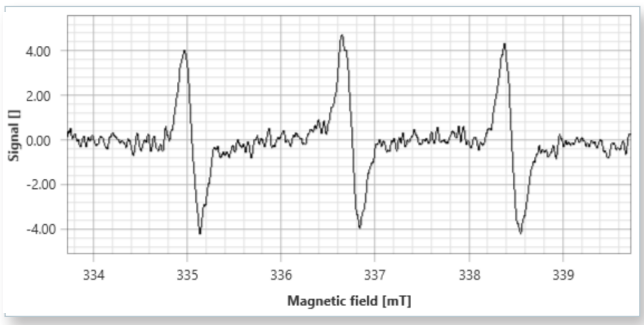
Magnettech ESR5000

- Benchtop EPR Spectrometer

Big things come in small packages

The Magnettech ESR5000 is an innovative research instrument with outstanding performance. It offers dedicated and tailored turn-key solutions for specific quality control, medical, and pharmaceutical applications. The Magnettech ESR5000 delivers research grade sensitivity, a wide magnetic field sweep range, and flexible experimental design, giving you a compact and easy-to-use benchtop solution to fulfill the needs of both academic and industrial laboratories.

The Magnettech ESR5000



50 nM TEMPOL in water

Easy to Install: The Magnettech ESR5000 makes EPR accessible in the lab where users and operators work. It can be installed on a bench or in a fume hood without the need for new infrastructure, providing easy maintenance and minimal cost of ownership. The performance of the benchtop, combined with intuitive software, means any lab can now incorporate the definitive analytical answers only EPR can provide.

Easy to Use: Customizable workspaces, automatic acquisition schemes with pre-defined, dedicated workflows and data evaluation are standard in the Magnettech ESR5000 software. Even non-experienced users with minimal training can work with the Magnettech ESR5000 because of the intuitive ESRStudio software and the ease of instrument operation.

Easy to do More: The Magnettech ESR5000 is designed for today's laboratory requirements. It combines easy operation with X-band research grade sensitivity and affordability. The magnet provides high quality results without requiring cooling water. The robustness of the instrument allows it to be used in the laboratory and factory.

Sensitivity and Stability

No matter what the focus of your application is, the critical requirements of an EPR spectrometer are sensitivity and stability. With the proven expertise in microwave technology, Magnettech ESR5000 provides the highest sensitivity available for benchtop EPR.

With Bruker's extensive worldwide Application Support and Global Service Network, any customer can confidently add, or enhance, their lab with research quality EPR:

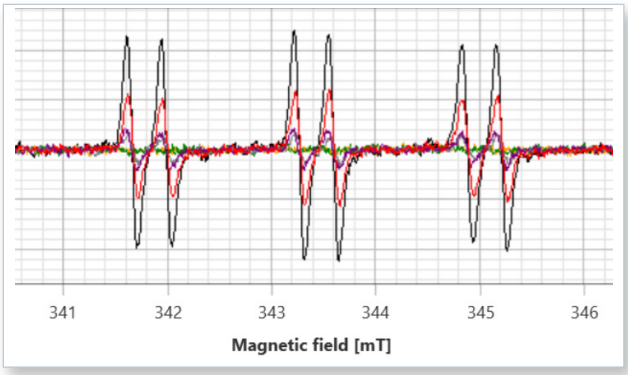
- Quantitative EPR with reference free **SpinCount**
- Spectrum simulation and fitting with **SpinFit Liquids**
- Spin-trap library
- **Sequence Editor** for complex workflows
- Remote system diagnostics

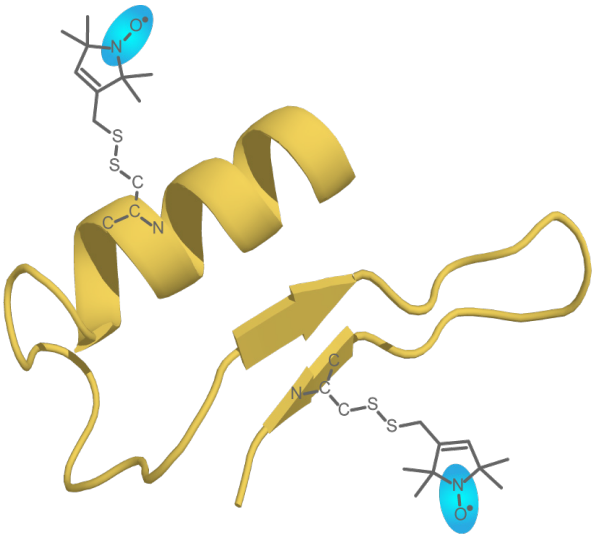
Application Fields

Small Molecule Structure and Quantification with SpinFit Liquids/SpinCount

- Interpret the types of radicals in your sample
- Quantify and evaluate their effects on the properties of interest
- Study free radical reactions and kinetics, including oxidative stress and reactive oxygen species (ROS)

ROS detection in biological sample over time

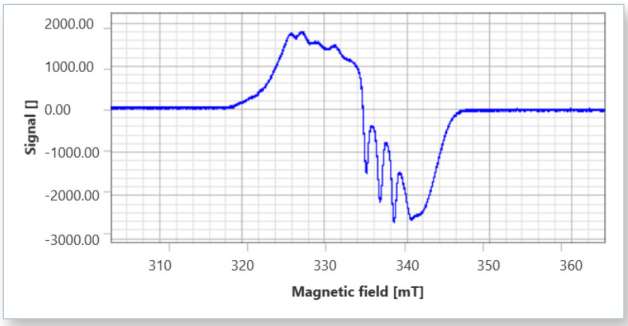




Macromolecular Structure

- Evaluate metal centers, ligands and substrate binding in proteins, DNA and RNA
- Measure spin-labeling efficiency
- Determine structural information
- Observe electron transfer pathways and amino based radicals in proteins

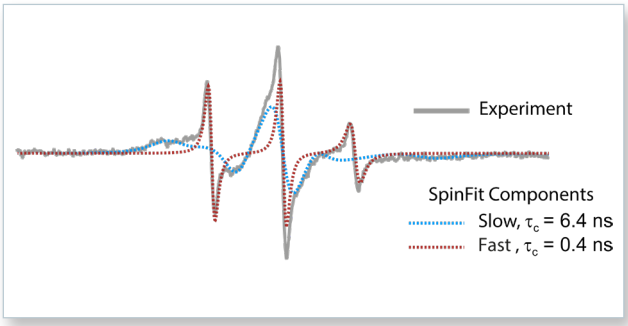
EPR spectrum of Hb-NO measured at 77 K



Chemical and Molecular Dynamics

- Observe molecular motion, e.g. dynamics of protein-lipid interactions
- Determine conformational changes of membrane proteins
- Investigate kinetics of chemical reactions

Spin-labeled ADP binding to a protein



Chemistry
Reaction kinetics, free radical chemistry, catalysts, bioinorganic chemistry, molecular magnetism, redox chemistry

Biology
Membrane proteins, metalloenzymes, intrinsically disordered proteins, photosynthesis, RNA, DNA, spin labeling/trapping, nitric oxides, ROS & RNS

Material Science
Polymer degradation, paint properties, solar cells, fuel cells, impurities in optical glass, batteries

Physics
Defects in semiconductors, transition metals, quantum computing

Industry/Routine Analysis
Free radicals in polymers and polymerization, food science and beverages, shelf-life determination, oxidative stability, antioxidant capacity, photo/oxidative degradation of pharmaceuticals, cosmetics, alanine dosimetry

See more Applications

ESRStudio Software

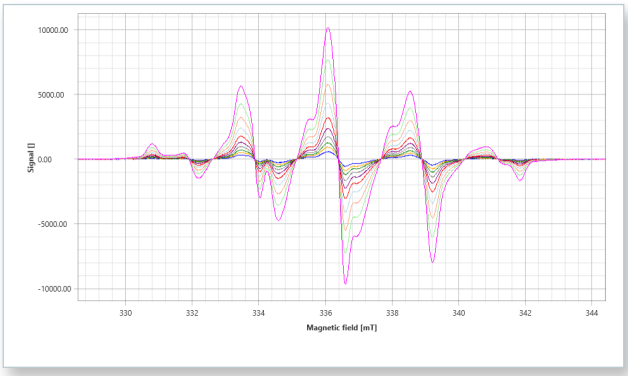
User-friendly Multi-tool

- Predefined experiments – Recipes
- Automated data collection, processing, storage, and lab report generation
- Quantitative package: SpinFit Liquids and reference-free SpinCount modules
- Dedicated module for alanine dosimetry
- Full software control of accessories
- Microsoft Windows™ platform
- Import/export of .csv and BES^{3}T files

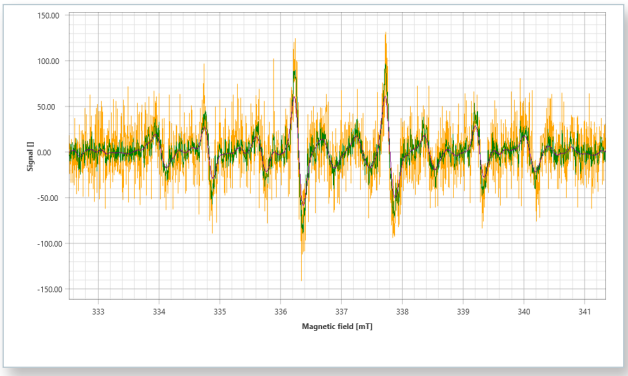
Available Experiment Series in ESRStudio

- 1D Field sweep
- 1D and 2D Kinetics
- Temperature series
- Sample rotation series
- Amplitude modulation sweep
- Power sweep
- UV-Vis irradiation series

Power sweep of Alanine radical



Signal-to-noise ratio improvement of weak signals

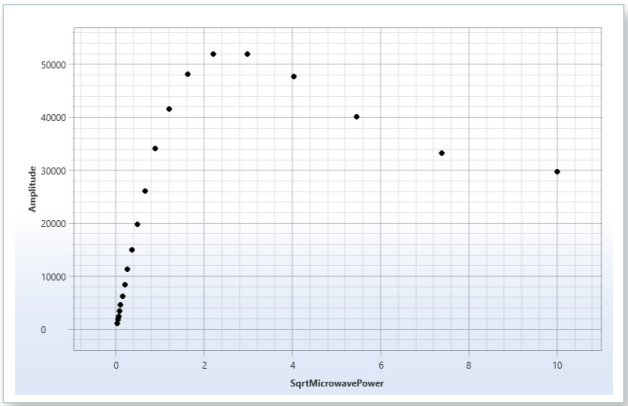


- ESRStudio provides a complete **post-processing** package for analyzing acquired data. Digital filtering of noisy spectra, resolution enhancement, baseline correction, double integration, differentiation, peak picking and many more functions are performed in a few easy steps.

- The **Sequence Editor** is an intuitive tool to create and control experiment sequences. It enables unattended running of a sequence of experiments also in combination with the autosampler for multiple samples.

- The **Evaluation View** is a powerful and extensive tool to analyze 2D-data, such as power sweeps, kinetic series, sample rotation series, and calibration curves. The power to generate custom evaluation functions tailors the software to the user needs.

Power sweep analysis



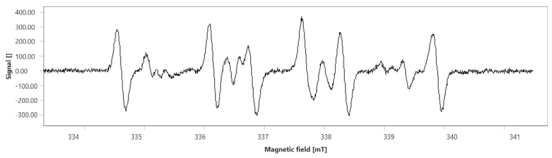
SpinFit Liquids and SpinCount

SpinFit Liquids is an easy-to-use module for simulation and fitting of EPR spectra:

- A library of commonly encountered radical species to facilitate analysis
- Support for 1D and 2D datasets
- Resolve multiple overlapping spectra to measure individual concentrations
- Seamlessly interfaced with SpinCount
- Quantitative with high precision even with low signal-to-noise

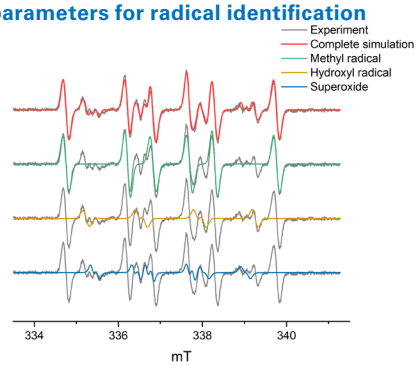
Cavity template for precise and reproducible sample positioning

Analyzing a multi-component spectrum with SpinFit Liquids



SpinFit

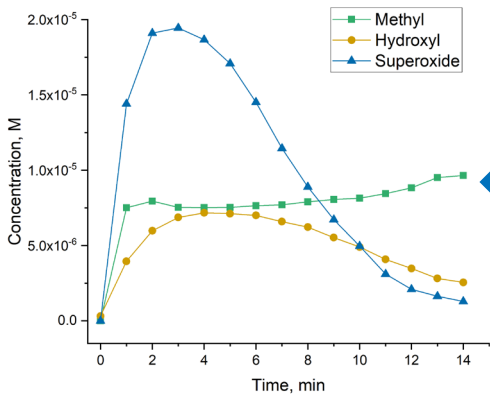
Spin-trap library with literature defined parameters for radical identification



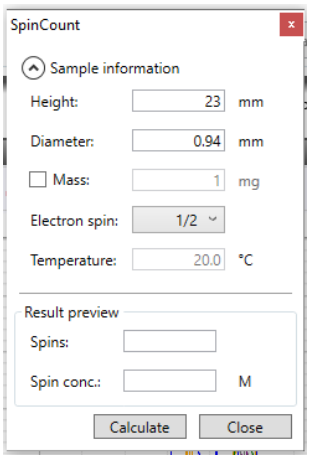
Simulated spectra becomes Kinetic data

SpinCount

Absolute and reference-free quantification



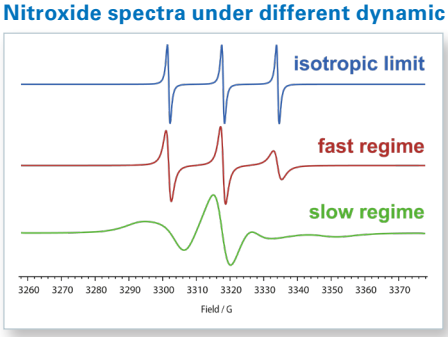
SpinCount report with individual concentrations



Paramagnetic species are sensitive reporters of global and local motional dynamics. SpinFit Liquids offers powerful simulation and fitting capabilities to unlock this important information over all dynamic ranges with the appropriate theoretical description.

- Automatic choice of dynamic regime
- Easy and precise simulation and fitting of spectra under different motional dynamic regimes

Nitroxide spectra under different dynamic regimes



Accessories for Temperature Variation

Full temperature range

Liquid Nitrogen Variable Temperature Controller (TCH04)

The compact, digital temperature control system uses nitrogen for safe and stable temperature control (93 – 473 K).
Easy and quick sample exchange at every temperature offers safe operation and high measurement throughput.

TCH04

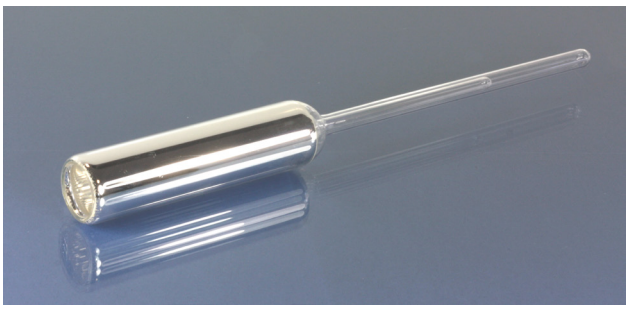
Accessories for special temperature needs

Liquid Nitrogen Finger Dewar
The finger Dewar minimizes experimental set-up for quick operation at 77 K.

Biological Temperature Controllers - BTC
BTC01 (293 – 350 K)
BTC03 (273 – 313 K)
To maintain biological samples at physiological or elevated metabolic activity conditions.

High Temperature Controller - HTC (323 – 723 K)
From forced oxidation assays (stress testing) to polymer annealing this temperature controller is developed for a wide range of industrial applications.

Finger Dewar



BTC01 (293 – 350 K)

Accessories

Autosampler

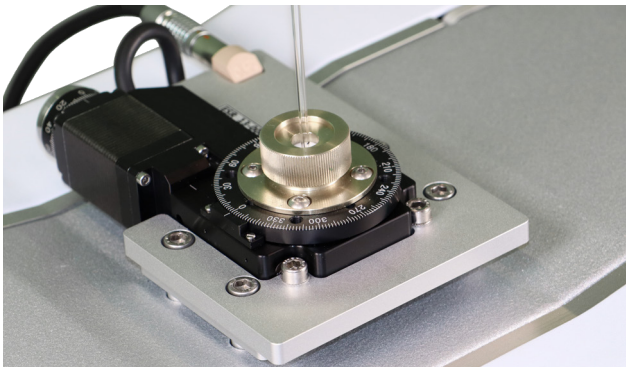
The autosampler enables unattended sample insertion and measurement, thus improving experimental productivity and reproducibility. The autosampler accommodates up to 26 samples in quartz tubes (3 – 6 mm diameter) with the ability to run different experiments for each position. Repetitive measurements of each position can be done for statistical analysis.

Automated Goniometer

Samples with orientation dependent spectra are easily measured with a fully automated angular rotation with a high precision step size of 0.1° from 0° to 180°.

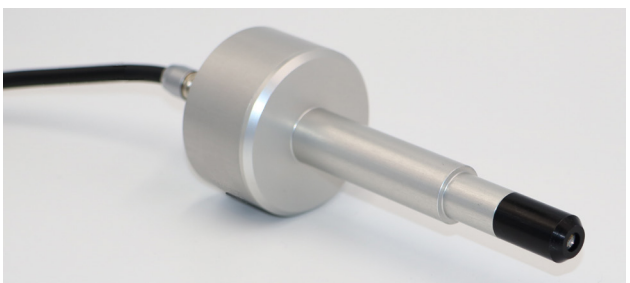
Flow System

Ideal for reaction monitoring and flow measurements, the flow system is a complete solution that is equipped with a peristaltic pump for continuous or pulsed flow operation and is fully controlled by ESRStudio.



UV-Vis Irradiation Unit

Software controlled illumination to study photochemical radical reactions or photophysical production of excited paramagnetic states. Both integrated single wavelength sources as well as broad spectrum irradiation units are available to suit user needs.

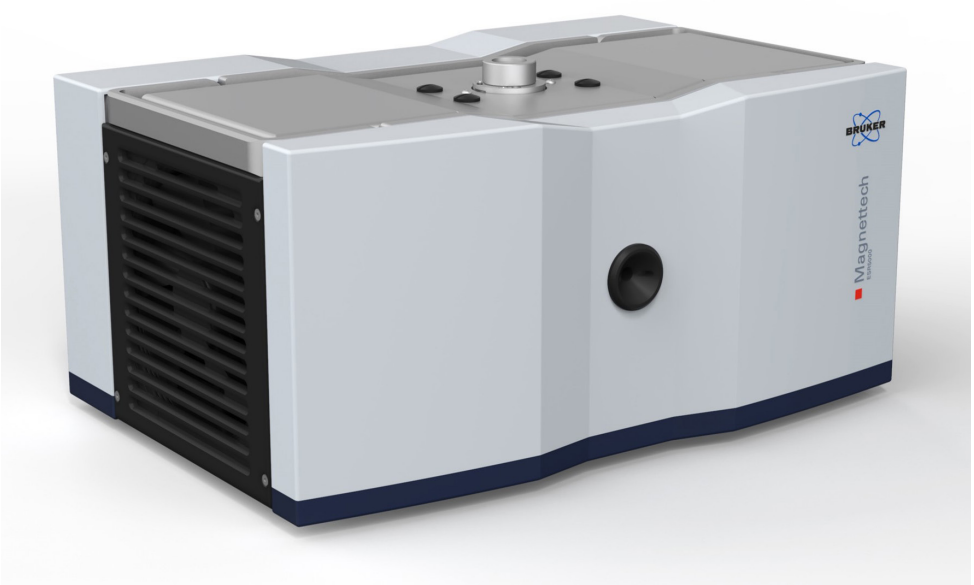


Glassware for Dedicated Applications

- Sample tubes made of high-quality quartz with 3-, 4-, 5-, and 6-mm OD to match the required sample volume
- Flat cells for liquid samples with high dielectric loss such as water or other polar solvents
- A tissue cell for studying tissues (skin sections, organ slices, pastes and emulsions) and 2D shaped materials

Horizontal Mounting

Rotates spectrometer for lateral sample insertion



Magnettech ESR5000 Technical Specifications	
Operating frequency	X-band
Microwave power	1 µW – 100 mW
Sensitivity	5 x10^{10} spins/mT (5 x 10^{9} spins/G)
Concentration sensitivity	20 pM
Field homogeneity	∓ 5 µT (50 mG) within sample region
Field stability	1.0 µT/h (10 mG/h)
Sweep resolution (field and time)	≥ 250 000 points
Magnetic field range	-10 - 650 mT (-100 - 6500 G)
Modulation frequency	10 kHz and 100 kHz
Compact size	45 kg, 397 x 262 x 192 mm

Bruker BioSpin

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RIFERIMENTO PER L'ITALIA

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