OVERVIEW

The International Bologna Conference on Magnetic Resonance in Porous Media, acronym MRPM, was first started at the University of Bologna, Italy, in 1990. In the past thirty years, MRPM travels across the world from Italyto UK, Belgium, Norway, Germany, France, USA, New Zealand. Over the years, MRPM becomes a gathering point for scholars, students and industrial professionals to exchange ideas and collaborate on important projects. It develops an inclusive culture for different people and diverse topics.

This year, the 15th MRPM conference travels to China, and to the beautiful city of Hangzhou. Hangzhou locates in the Zhejiang Province of China, one hundred kilometers south of Shanghai. Hangzhou was once the capital city of China about one thousand years ago. It was the east end of the silk road as it has been producing world-famous silk and tea for more than a thousand years. It is called “the heaven” in China for its gorgeous view of West Lake and the quiet retreats in tea plantation hills. Nowadays, Hangzhou is an economic powerhouse thanks to the fast development of internet economy.

MRPM15 is hosted by Zhejiang University, a prestigious multidisciplinary higher-education institute in China. It constitutes seven campuses and hosts more than 60,000 students. The people in Zhejiang University participate in top-level academic and industrial research activities. The university has a solid-state NMR center and a medical magnetic resonance imaging center. It also supports diverse research groups in the areas related to porous media.

The honorary chairman of this conference is Professor Jiangfeng Du who is known for the pioneering work in single molecular detection by magnetic resonance. The executive chairmen of the conference are Professor Xueqian Kong and Professor Ruiliang Bai.

CONFERENCE COMMITTEE

CONFERENCE CHAIRS

Honorary Chair 2022: Jiangfeng Du

Conference Chair 2022: Xueqian Kong Ruiliang Bai

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Treasurer: Siegfried Stapf

KEYNOTE + INVITED SPEAKERS

Keynote Speakers

Jeffrey A. Reimer, University of California, Berkeley, USA
Peter J. Basser, NIH, USA
Leonardo Brizi, University of Bologna, Italy
Klaus Schmidt-Rohr, Brandeis University, USA
Jiangfeng Du, University of Science and technology of China, China
Lizhi Xiao, China University of Petroleum, China
Xin Zhou, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, China
Zhong Chen, Xiamen University, China
Wei Wang, Lanzhou University, China

Invited speakers

Rustem Valiullin, Leipzig University, Germany
Christoph H. Arns, University of New South Wales, Australia
Alexej Jerschow, New York University, USA
Aaron J. Rossini, Iowa State University, USA
Tito José Bonagamba, University of São Paulo, Brasil
Ville-Veikko Telkki, University of Oulu, Finland
Evren Ozarslan, Linköping University, Sweden
William S. Price, Western Sydney University, Australia
Sharon E. Ashbrook, University of St Andrews, UK
Yongchao Su, Merck, USA
Dimitrios Sakellariou, KU Leuven, Belgium
Villiam Bortolotti, University of Bologna, Italy
Ileana O Jelescu, Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Switzerland
Magnus Herberthson, Linköping University, Sweden
Yue Wu, University of North Carolina at Chapel Hill, USA
Kong Ooi Tan, École Normale Supérieure, France
Gerd Buntkowsky, TU Darmstadt, Germany
Yefeng Yao, East China Normal University, China
Hua Guo, Tsinghua University, China

Dan Wu, Zhejiang University, China
Chunsheng Zhou, Harbin Institute of Technology, China
Zheng Xu, Chongqing University, China
Fangrong Zong, Beijing University of Posts and Telecommunications, China
Jun Xu, Wuhan Institute of Physics and Mathe-matics, Chinese Academy of Sciences, China
Guangjin Hou, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China
Luming Peng, Nanjing University, China
Bingwen Hu, East China Normal University, China

NMR SCHOOL SPEAKERS

Yiqiao Song, Harvard University, USA
Bernhard Blümich, RWTH Aachen University, Germany
Daniel Topgaard, Lund University, Sweden
Ben Newling, University of New Brunswick, Canada
Zonghai Harry Xie, CoreLab, USA
Bruce J. Balcom, University of New Brunswick, Canada

Local Organizing Institute

Department of Chemistry Zhejiang University

http://www.chem.zju.edu.cn/

Zhejiang University Interdisciplinary Institute of Neuroscience and Technology

http://www.ziint.zju.edu.cn/

MOE Frontier Science Center for Brain Science and Brain-Machine Integration

http://www.neuroscience.zju.edu.cn/

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Program-AT-A-Glance

NMR SCHOOL, ZOOM (Aug. 21, Beijing 20:00-24:00, New York 8:00-12:00, Berlin 14:00-18:00)		
SUNDAY, AUGUST 21ST 2022	19:55-20:00	Opening Speech
	20:00-24:00	Tutorial Lectures
MRPM15, ZOOM (Aug 22 to Aug 24, Beijing 20:00-24:00, New York 8:00-12:00, Berlin 14:00-18:00)		
MONDAY, AUGUST 22ND, 2022	20:00-20:15	Welcome Remarks
	20:15-22:00	Keynote Session 1 (Jeffery A. Reimer & Peter J. Basser)
	22:00-24:00	Session 1: Methodology and Geophysics
		Session 2: Hardware development and applications
TUESDAY, AUGUST 23RD, 2022	20:00-20:45	Keynote Session 2 (Leonardo Brizi)
	20:45-22:00	Session 3: Low field MR and Applications
		Session 4: Relaxometry and Dynamics
	22:10-24:00	Session 5: Diffusion and Dynamics
		Session 6: New Applications of MR
WEDNESDAY, AUGUST 24TH, 2022	20:00-20:45	Keynote Session 3 (Klaus Schmidt-Rohr)
	20:45-22:00	Session 7: Solid-state and Nanoporous Materials
		Session 8: Relaxometry and related topics
	22:10-24:00	Session 9 - Biomedicine, Biophysics, and MRI
		Session 10 - Adsorption in Porous Materials
MRPM15, IN-PERSON (Aug 25 to Aug 26, Beijing 8:30-18:00, New York 20:30-6:00, Berlin 2:30-12:00) The attendees can attend the conference either online or in person.		
THURSDAY, AUGUST 25TH, 2022	08:30-08:40	Opening Speech
	08:40-10:10	Keynote Session 4 (Jiangfeng Du & Lizhi Xiao)
	10:10-10:30	Photos & Coffee Break
	10:30-12:00	Session 11
	12:00-13:30	Lunch break
	13:30-15:05	Session 12
	15:05-16:00	Poster Session
	16:00-18:00	Session 13
FRIDAY, AUGUST 26TH, 2022	08:30-10:30	Session 14
	10:45-12:00	Session 15
	12:00-13:30	Lunch break
	13:30-15:05	Session 16
	15:20-17:10	Session 17
	17:10-18:00	Awards & Closing ceremony

NMR SCHOOL SCHEDULE

Beijing Time

SUNDAY, AUGUST 21ST 2022 ZOOM ONLINE

Chair: Xueqian Kong & Ruiliang Bai

19:55 – 20:00	Opening speech
20:00 – 20:40	Lecture 1: Yiqiao Song, Harvard University, USA, *The history, current, and future of magnetic resonance in porous media*
20:40 – 21:20	Lecture 2: Bernhard Blümich, RWTH Aachen University, Germany, *NMR Hardware*
21:20 – 22:00	Lecture 3: Daniel Topgaard, Lund University, Sweden, *Translational motion and magnetic field gradients*
22:00 – 22:40	Lecture 4: Ben Newling, University of New Brunswick, Canada, *Take the current when it serves: flow quantification in magnetic resonance*
22:40 – 23:20	Lecture 5: Zonghai Harry Xie, Core Lab, USA, *NMR Applications in Rock Core Analysis – from Conventional to Unconventional*
23:20 – 24:00	Lecture 6: Bruce J. Balcom, University of New Brunswick, Canada, *Magnetic Resonance Imaging of Materials*

MRPM15 SCHEDULE

Beijing Time

MONDAY, AUGUST 22ND 2022 ZOOM ONLINE

MRPM15 Conference Opening Ceremony

20:00 – 20:15 Welcome Remarks

Keynote Session 1

Chair: Xueqian Kong & Ruiliang Bai

20:15 – 21:00 **Keynote lecture**: Jeffrey A. Reimer, University of California, Berkeley, USA, *A Molecular View of Carbon Capture with Porous Materials*

21:00 – 21:45 **Keynote lecture**: Peter J. Basser, NIH, USA, *Probing Tissue Microstructure and Function*

Coffee Break

21:45 – 22:00

Session 1 - Methodology and Geophysics

Chair: Yiqiao Song, Harvard University, USA

22:00 – 22:25 **Invited lecture 1:** Rustem Valiullin, Leipzig University, Germany, *Advanced NMR cryoporometry*

22:25 – 22:50 **Invited lecture 2:** Christoph H. Arns, University of New South Wales, Australia, *NMR response interpretation utilizing Digital Rock Physics*

22:50 – 23:05 Normal oral 1: Jing Li, University of Oulu, Finland, *^{129}Xe NMR analysis reveals efficient gas transport between inborn micro-, meso- and macropores in geopolymers*

23:05 – 23:13 Short oral 1: Alfredo Ordinola, Linköping University, Sweden, *Measurement of the apparent diffusion propagator*

23:13 – 23:21 Short oral 2: Sabine Kruschwitz, Bundesanstalt für Materialforschung und -prüfung (BAM) und TU Berlin, Germany, *Non-destructive testing application examples using the NMR core-analyzing tomograph*

23:21 – 23:29 Short oral 3: Tatiana Monaretto, Center National De La Recherche Scientifique (CNRS), France, *Dynamics of pore filling by spatially-resolved relaxometry*

23:29 – 23:37 Short oral 4: Siegfried Stapf, TU Ilmenau, Germany, *Ageing of reservoir rocks: a multinuclear NMR relaxometry study*

23:37 – 23:45 Short oral 5: Mark Armstrong, University of Windsor, Canada, *Optimized Phase Cycling for Coherence Pathway Selection in Unbalanced Fast Spin-Echo*

23:45 – 23:53 Short oral 6: Shin Utsuzawa, Schlumberger, USA, *Ringing cancellation in Carr-Purcell-Meiboom-Gill-type sequences*

Session 2 – Hardware development and applications

Chair: Bernhard Blümich, RWTH Aachen University, Germany

22:00 – 22:25	**Invited lecture 1:** Alexej Jerschow, New York University, USA, *MRI and magnetometry techniques for battery research and development*
22:25 – 22:50	**Invited lecture 2**: Dimitrios Sakellariou, KU Leuven, Belgium, *Custom-made Magnetic Resonance: An application-driven instrumentation approach for materials engineering*
22:50 – 23:15	**Invited lecture 3**: Kong Ooi Tan, École Normale Supérieure, *Building a 263 GHz Pulsed DNP Microwave Bridge, Waveguides, Probe, and MAS Drive Caps*
23:15 – 23:30	Normal oral 1: Thomas Hiller, Federal Institute for Geosciences and Natural Resources (BGR), Germany, *Towards a mobile soil moisture mapping application based on prepolarized surface-NMR*
23:30 – 23:45	Normal oral 2: Shiwen Chen, RIPED Petrochina, China, *Development and Applications of the MR Multi-Phase Flowmeter*
23:45 – 24:00	Normal oral 3: Xiaoguang Zhao, Tsinghua University, China, *Improving unilateral magnetic resonance efficiency using metamaterial-enhanced radio frequency coil*
24:00 – 24:08	Short oral 1: William Selby, University of New Brunswick, Canada, *A Simple Portable Magnetic Resonance Technique for Characterizing Circular Couette Flow of Non-Newtonian Fluids*

TUESDAY, AUGUST 23RD 2022 ONLINE

Keynote Session 2

Chair: Sabina Haber-Pohlmeier, Universität Stuttgart, Germany

20:00 – 20:45 **Keynote lecture:** Leonardo Brizi, University of Bologna, Italy, *Recent advances on single-sided NMR applications and proof of concept of low-field NMR Fingerprinting aided by Artificial Intelligence*

Session 3 – Low field MR and Applications

Chair: Xiaoguang Zhao, Tsinghua University, China

20:45 – 21:10 **Invited lecture 1**: Tito José Bonagamba, University of São Paulo, Brasil, *NMR signals from mechanically oscillating samples in a single-sided magnet: a simple Logging-While-Drilling simulator*

21:10 – 21:25 Normal oral 1: Eric Schmid, Karlsruhe Institute of Technology, Germany, *Low-Field NMR Sensor for Inline-Quality Control Applications*

21:25 – 21:40 Normal oral 2: Rui Chen, University of Shanghai for Science and Technology, China, *Study on low-field nuclear magnetic resonance analytical technique of edible oil*

21:40 – 21:48 Short oral 1: Agide Gimenez Marassi, University of São Paulo, Brazil, *NMR signals from oscillating samples in the presence of a magnetic field gradient*

21:48 – 21:56 Short oral 2: Henry R. N. B. Enninful, Leipzig University, Germany, *Advanced Kernel-Based NMR Cryoporometry Characterization of Mesoporous Solids*

Session 4 – Relaxometry and Dynamics

Chair: Siegfried Stapf, TU Ilmenau, Germany

20:45 – 21:10 **Invited lecture 1:** Ville-Veikko Telkki, University of Oulu, Finland, *Ultrafast multidimensional relaxation and diffusion measurements*

21:10 – 21:25 Normal oral 1: Manuel I. Velasco, Universidad Nacionla de Cordoba, Argentina, *Organic matter detection in T_1-T_2 relaxation maps for shale reservoirs*

21:25 – 21:40 Normal oral 2: Mohammad Sadegh Zamiri, University of New Brunswick, Canada, *Shale Characterization Using 2D Magnetic Resonance T_1-T_2^* Relaxation Correlation and SPRITE MRI*

21:40 – 21:55 Normal oral 3: Tristhal Parasram, University of Windsor, Canada, *Magnetic Resonance T_1 Spectrum Analysis with Neural Networks*

Coffee Break

22:00 – 22:10

Session 5 – Diffusion and Dynamics
Chair: Fangrong Zong, Beijing University of Posts and Telecommunications

22:10 – 22:35	**Invited lecture 1:** Evren Özarslan, Linköping University, Sweden, *Characterizing structural heterogeneity and water dynamics with novel diffusion MR*
22:35 – 23:00	**Invited lecture 2:** William S. Price, Western Sydney University, Australia, *Faster NMR Diffusion Measurements for Porous Media and Reactions*
23:00 – 23:15	Normal oral 1: Benedict Newling, University of New Brunswick, Canada, *Laminar Velocity Profile Measurements from Spin Echoes at Incomplete Polarization*
23:15 – 23:23	Short oral 1: Anne Selent, University of Oulu, Finland, *Laplace NMR study of surfactants in aqueous solutions*
23:23 – 23:31	Short oral 2: Sarah Mailhiot, University of Oulu, Finland, *2D variable echo time CPMG acquisition for D-T_2 correlation measurements utilizing a constant gradient*
23:31 – 23:39	Short oral 3: Alice Ducroix, Laboratoire PHENIX, Sorbonne Université, CNRS, France, *Dynamics and molecular transport of water inside boehmite suspensions probed by PFG-NMR*
23:39 – 23:47	Short oral 4: Carlo Golini, University of Bologna, Italy, *A single-sided NMR procedure to study structural differences of the cartilage tissue*
23:47 – 23:55	Short oral 5: Arthur Gustavo de Araujo -Ferreira, University of São Paulo, Brazil, *A Benchtop Single-Sided RF-Shielded Magnet for Low Field NMR applications*

Session 6 – New Applications of MR
Chair: Zonghai Harry Xie, CoreLab, USA

22:10 – 22:35	**Invited lecture 1:** Aaron J. Rossini, Iowa State University, USA, *Structural Characterization of Boron Nitride and Oxide Materials by Dynamic Nuclear Polarization and Ultrahigh Field 35 T Solid-State NMR Spectroscopy*
22:35 – 23:00	**Invited lecture 2:** Yongchao Su, Merck, USA, *Molecular Details of Amorphous Pharmaceuticals from Solid-State NMR and X-ray Atomic Pair Distribution Function*
23:00 – 23:15	Normal oral 1: Jyotsana Ojha, Indian Institte of Science Education and Research Mohali India, India, *NMR spectroscopic approach to investigate the dynamics and heterostructure of fluorinated ionic liquids and their binary mixtures*
23:15 – 23:23	Short oral 1: Siegfried Stapf, TU Ilmenau, Germany, *Binary fluid systems in porous media: redistribution of miscible and immiscible fluids and the effect on their relaxation properties*

23:23 – 23:31	Short oral 2: Bulat Gizatullin, Technische Universität Ilmenau, Germany, *Studying of Radicals on the Surface by DNP FFC: Ageing or Origin?*
23:31 – 23:39	Short oral 3: Tian He, Zhejiang University, China, *Cortical Bone under Ultrahigh Magnetic Field: Relaxation, Spectroscopy and Micron-resolution Imaging*
23:39 – 23:47	Short oral 4: Yashu Kharbanda, University of Oulu, Finland, *Cheese Maturation Studies by Single-Sided Magnet*
23:47 – 23:55	Short oral 5: Tiia Jacklin, University of Oulu, Finland, *Modeling Xe NMR in carbon nanotubes*

WEDNESDAY, AUGUST 24TH 2022 ONLINE

Keynote Session 3

Chair: Xueqian Kong, Zhejiang University, China

20:00 – 20:45	**Keynote lecture:** Klaus Schmidt-Rohr, Brandeis University, USA, *Solid-State NMR of Polymer–MOF Composites*
20.45 – 20.50	Introducing MRPM16 (Kate Anderson)

Session 7 – Solid-state and Nanoporous Materials

Chair: Ben Newling, University of New Brunswick, Canada

20:50 – 21:15	**Invited lecture 1:** Sharon E. Ashbrook, University of St Andrews, UK, *Exploiting ^{17}O Isotopic Enrichment in NMR Spectroscopy of Microporous Materials*
21:15 – 21:30	Normal oral 1: Jun Xu, Nankai University, China, *Deconvolution of Metal Apportionment in Bulk Metal–Organic Frameworks*
21:30 – 21:45	Normal oral 2: Frédérique Pourpoint, Centrale Lille, France, *Solid-State NMR to study Metal-Organic Frameworks*
21:45 – 22:53	Short oral 1: Jeremias C. Zill, Leipzig University, Germany, *Kinetics of a structural phase transition in MIL-53(Al)-NH_2*
21:53 – 22:01	Short oral 2: Daniil I. Kolokolov, Boreskov Institute of Catalysis, Russia, *Probing light hydrocabons mobility by ^2H NMR in nanoporous UiO-66 MOF: effects of inorganic centers hydroxylation and framework defects*

Session 8 – Relaxometry and related topics -II

Chair: Ruiliang Bai, Zhejiang University, China

20:50 – 21:15	**Invited lecture 1:** William Bortolotti, University of Bologna, Italy, *Inversion problems and robust NMR parameter estimation: the Uniform Penalty principle extension Mupen*
21:15 – 21:30	Normal oral 1: Keelan T. O'Neill, University of Western Australia, Australia, *Pore size and relaxation characterisation of Lunar and Martian planetary simulants*
21:35 – 21:45	Normal oral 2: Neil Robinson, University of Western Australia, Australia, *Functional group resolved relaxation in porous media*
21:45 – 21:53	Short oral 1: Arthur Gustavo Araújo-Ferreira , University of Sao Paulo, Brazil, *NMR on Porous Media: Surface relaxivity and Magnetic Susceptibility*
21:53 – 22:01	Short oral 2: Can Liang, Changzhou Institute of Technology, China, *Rock Wettability Characterization Using NMR Free Induction Decay*

Coffee Break

22:01 – 22:10

Session 9 -Biomedicine, Biophysics, and MRI
Chair: Evren Ozarslan, Linköping University, Sweden

22:10 – 22:35	**Invited lecture 1**: Ileana O Jelescu, Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Switzerland, *Water exchange across cell membranes in brain gray matter*
22:35 – 23:00	**Invited lecture 2**: Magnus Herberthson, Linköping University, Sweden, *The influence of diffusion across semi-permeable membranes on the MR signal: Insights from a one-dimensional model*
23:00 – 23:15	Normal oral 1: Ke Dai, Shanghai Jiao Tong University, China, *High-resolution diffusion-weighted MRI combining markerless prospective motion correction and locally low-rank constrained reconstruction*
23:15 – 23:30	Normal oral 2: Jonathan L. MacNeil, University of Windsor, Canada, *T_2 Mapping using Fast Spin Echo with Point Spread Function Correction*
23:30 – 23:45	Normal oral 3: Yonghong Ding, Max Planck Institute for Multidisciplinary Science, Germany, *In-cell real-time monitoring of pyruvate metabolic conversion on Parkinson cell models via para-hydrogen induced polarization (PHIP)*
23:45 – 23:53	Short oral 1: Alfredo Ordinola, Linköping University, Sweden, *Characterizing structure and diffusion exchange: Comparing subsampling strategies*
23:53 – 24:01	Short oral 2: Yu Zeng, Zhejiang University, *Comparisons of Parkinson's Disease Related Patterns in ASL MRI and FDG PET*

Session 10 – Adsorption in Porous Materials
Chair: Daniel Topgaard, Lund University, Sweden

22:10 – 22:35	**Invited lecture 1**: Yue Wu, University of North Carolina at Chapel Hill, USA, *Correlations of Microscopic and Macroscopic Properties of Porous Media Obtained by NMR-detected Isotherm Technique*
22:35 – 23:00	**Invited lecture 2**: Gerd Buntkowsky, TU Darmstadt, Germany, *Solid-state NMR and DNP studies of guest molecules confined in porous silica materials*
23:00 – 23:15	Normal oral 1: Chevallier-Boutell I J, IFEG, Argentina, *Non-negligible interactions of alkanes with silica mesopores affect self-diffusivity: a combined experimental and theoretical approach*
23:15 – 23:30	Normal oral 2: Janis Hessling, University of Münster, Germany, *Spin relaxation studies of an ionic liquid-based electrolyte confined in porous materials*
23:30 – 23:45	Normal oral 3: Minghui Zhang, Inner Mongolia Agricultural University, China, *Cell Wall Water States in Wood Studied by TDNMR during Adsorption*

23:45 – 23:53	Short oral 1: Roya Khalili, University of Oulu, Finland, *Local structures and adsorption properties of rare earth phosphates*
23:53 – 24:01	Short oral 2: Marie Bernardi, The University of Mons, Belgium, *Benchtop NMR relaxometry for the follow-up of Ni(II) removal by three ion exchange resins.*

THURSDAY, AUGUST 25TH 2022 (HYBRID)

金溪山庄，杭州市西湖区杨公堤 39 号

08:30 – 08:40 am **Opening speech**

Chair: Zhou Xin, Wuhan Institute of Physics and Mathematics, China

08:40 – 09:25 am **Keynote lecture 1**: Jiangfeng Du, University of Science and technology of China, China, *Single molecule magnetic resonance spectroscopy and imaging*

09:25 – 10:10 am **Keynote lecture 2**: Lizhi Xiao, China University of Petroleum, China, *Borehole NMR Inside-out Imager for Porous Materials*

Coffee Break and Photo

10:10 – 10:30

Session 11

Chair: Wei Wang, Lanzhou University, China

10:30 – 10:55 am **Invited lecture 1:** Yefeng Yao, East China Normal University, China, *Molecularly targeted MRI and MRS*

10:55 – 11:10 am Oral 1: Zhihao Long, China University of Petroleum (Beijing), China, *Determining Winding Patterns for RF Coils on Downhole Magnetic Resonance Imaging Tool Using Stream Functions and Target-Field Method*

11:10 – 11:25 am Oral 2: J. Beau W. Webber, Lab-Tools Ltd., UK, *The implementation of an easy-to-apply NMR Cryoporometric instrument for porous materials*

11:25 – 11:40 am Oral 3: Xinyu Zhang, China University of Petroleum (Beijing), China, *Pore structure characterization of complex lithology reservoir based on NMR logging*

11:40 – 11:55 am Oral 4: Lu Zhang, China University of Petroleum (Beijing), China, *Temperature sensitivity of NMR porosity*

Lunch and Break

12:00 – 13:30 am

Session 12

Chair: Jun Xu, Wuhan Institute of Physics and Mathematics

13:30 – 14:15 pm **Keynote lecture:** Xin Zhou, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, China, *Hyperpolarized Xenon multinuclear and CEST MRI in biomedicine*

14:15 – 14:40 pm **Invited lecture 1**: Hua Guo, Tsinghua University, China, *3D Diffusion MRI using Simultaneous Multi-slab Imaging*

14:40 – 15:05 pm	**Invited lecture 2**: Dan Wu, Zhejiang University, China, *Microstructural imaging with diffusion-time-dependent diffusion MRI*
15:05 – 16:00 pm	**Poster Session and Coffee Break**

Session 13

Chair: Chunsheng Zhou, Harbin Institute of Technology, China

16:00 – 16:15 pm	Oral 1: Yao Fu, French Alternative Energies and Atomic Energy Commission, France, *Revealing hidden defects in Metal-Organic Frameworks by solid-state NMR*
16:15 – 16:30 pm	Oral 2: Guowen Jin, China University of Petroleum (Beijing), China, *A New Method for Pore Structure Characterization of Porous Rocks Based on Low Field NMR*
16:30 – 16:45 pm	Oral 3: Xinglong Lei, China University of Petroleum (Beijing), China, *Quantitative evaluation of local porosity and heterogeneity in porous media with low-field NMR imaging*
16:45 – 17:00 pm	Oral 4: Zhe Zhang, China University of Petroleum (Beijing), China, *Prediction of NMR T_2 Spectrum AND T_2 CUT-OFF VALUE with Machine Learning Model*
17:00 – 17:15 pm	Oral 5: Guanghui Shi, China University of Petroleum (Beijing), China, *Automatic optimization of pulse sequence based on closed-loop control strategy*
17:15 – 17:30 pm	Oral 6: Zhen Xie, China University of Petroleum (Beijing), China, *Numerical simulation study on the influence of temperature on the restricted diffusion in porous media*
17:30 – 17:45 pm	Oral 7: Zijian Jia, University of Shanghai for Science and Technology, China, *Application of artificial intelligence on 2D NMR to identify shale components*
17:45 – 18:00 pm	Oral 8: Jiangfeng Guo, China University of Petroleum, China, *Two-dimensional magnetic resonance T_1-T_2^* relaxation correlation measurements and spectra*

Dinner

FRIDAY, AUGUST 26TH 2022 (HYBRID)

金溪山庄，杭州市西湖区杨公堤 39 号

Session 14

Chair: Lizhi Xiao, China University of Petroleum, China

08:30 – 09:15 am	**Keynote lecture:** Zhong Chen, Xiamen University, China, *High-resolution NMR spectroscopy for complex chemical and biological samples*
09:15 – 09:40 am	**Invited lecture 1:** Chunsheng Zhou, Harbin Institute of *Technology*, China, *Investigations into moisture-dependent pore structure of cement-based materials through the Low-Field NMR relaxation technique*
09:40 – 10:05 am	**Invited lecture 2**: Zheng Xu, Chongqing University, China, *A Portable Shielding-free 50mT Head Magnetic Resonance Imaging System*
10:05 – 10:30 am	**Invited lecture 3**: Fangrong Zong, Beijing University of Posts and Telecommunications, China, *Data processing in multi-dimensional NMR and MRI*

Coffee Break

10:30 – 10:45 am

Session 15

Chair: Bingwen Hu, East China Normal University, China

10:45 – 11:00 am	Oral 1: Shuanglan Yan, China University of Petroleum (Beijing), China, *The Study on NMR Response Mechanism and Evaluation Method of Basic Volcanic Rock*
11:00 – 11:15 am	Oral 2: Ruiqi Fan, China University of Petroleum (Beijing), China, *Quantitative Evaluation Method of Movable Oil Saturation in Shale Oil by NMR*
11:15 – 11:30 am	Oral 3: Yingyao Qin, Yangtze University, China, *Improvement of T_2-Pc 2D NMR inversion method for characterizing pore-throat connectivity*
11:30 – 11:45 am	Oral 4: Sihui Luo, China University of Petroleum (Beijing), China, *A Study on Improving Low-field NMR Echo Data Quality with Dictionary Learning*
11:45 – 12:00 am	Oral 5: Gang Luo, China University of Petroleum, China, *A Study on Multi-exponential Inversion of NMR Relaxation Data with Deep Learning*

Lunch and Break

12:00 – 13:30

Session 16

Chair: Luming Peng, Nanjing University, China

13:30 – 14:15 pm **Keynote lecture:** Wei Wang, Lanzhou University, China, *Host-Guest Chemistry of Covalent Organic Frameworks Revealed by Solid-State NMR Spectroscopy*

14:15 – 14:40 pm **Invited lecture 1**: Jun Xu, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, China, *Insight into active sties and catalytic reactions over metal-zeolites from solid-state NMR spectroscopy*

14:40 – 15:05 pm **Invited lecture 2**: Guangjin Hou, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China, *Solid-state NMR studies of syngas conversion on oxide-zeolite bifunctional catalysts*

Coffee Break

15:05 – 15:20 pm

Session 17

Chair: Yefeng Yao, East China Normal University, China

15:20 – 15:45 pm **Invited lecture 3**: Bingwen Hu, East China Normal University, China, *Magnetic resonance for Li-ion battery: from NMR to EPR*

15:45 – 16:10 pm **Invited lecture 4**: Luming Peng, Nanjing University, China, *Unveiling the surface structure of ZnO nanorods and H_2 activation mechanism with 17O NMR spectroscopy*

16:10 – 16:25 pm Oral 1: Haiming Liu, ShanghaiTech University, China, *Structural and Dynamic Study of MOFs by Solid-State NMR*

16:25 – 16:40 pm Oral 2: Feng Deng, PetroChina Research Institute of Petroleum Exploration & Development, China, *Magnetic Resonance Flow Measurement Method for Petroleum Industry*

16:40 – 16:55 pm Oral 3: Xi Chen, Beijing Limecho Technology Co., Ltd., China, *Hydration characerization of cement with recycled concrete powder by using ^1H NMR*

16:55 – 17:10 pm Oral 4: Jing Qiao, Harbin Institute of Technology, China, *Investigation into the relationship between the compressive strength and pore structure of saturated white cement mortars*

17:10 – 18:00 pm Awards & Closing ceremony

Dinner

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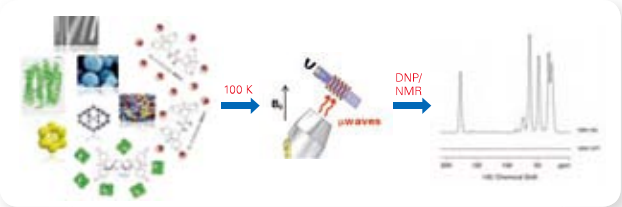
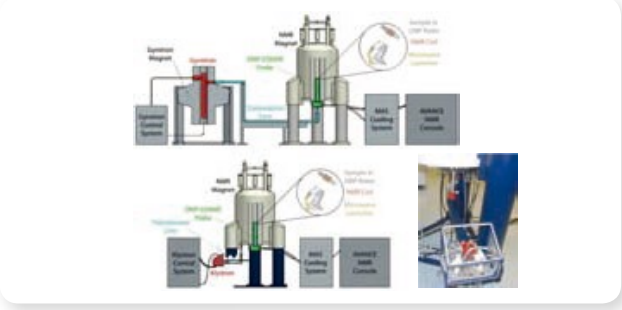
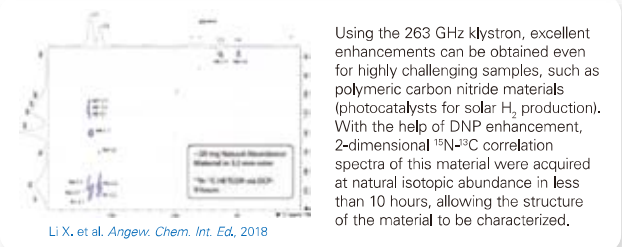


Gyrotron and Klystron Microwave Sources

Bruker's custom-designed gyrotron microwave sources and low-temperature MAS (LTMAS) probes have a proven record of performance with 53 installed systems to date. We also offer a 263 GHz Extended Interaction Klystron (EIK) with 5 W output power and high frequency/power stability. The 263 GHz klystron provides 80-100% of the gyrotron DNP efficiency (depending on the sample) with a lower purchase price, footprint and facility requirements.

Magnetic Field	^{1}H NMR Frequency	EPR/μwave Frequency	Microwave Source
9.4 T	400 MHz	263 GHz	Klystron
14.1 T	600 MHz	395 GHz	Gyrotron
18.8 T	800 MHz	527 GHz	Gyrotron
21.1 T	900 MHz	593 GHz	Gyrotron





Li X. et al. *Angew. Chem. Int. Ed.*, 2018

Using the 263 GHz klystron, excellent enhancements can be obtained even for highly challenging samples, such as polymeric carbon nitride materials (photocatalysts for solar H_2 production). With the help of DNP enhancement, 2-dimensional ^{15}N-^{13}C correlation spectra of this material were acquired at natural isotopic abundance in less than 10 hours, allowing the structure of the material to be characterized.

Fig. 1: Polymeric carbon nitride materials doped with 15 mM AMUPol in aqueous solvent yield excellent DNP signal enhancements of 71 with ~5 W of microwave power, allowing ^{15}N-^{13}C correlation spectra to be acquired rapidly even at natural isotopic abundance.

1.3 and 1.9 mm MAS DNP Probes

The DNP LTMAS probes operate in the 100-200 K temperature range with cold insert/eject capabilities. They are offered with HCN, HX, HXY (with variety of X/Y combinations) or low gamma RF configuration and the following rotor sizes to cover a range of applications at 400 to 900 MHz:

- 3.2 mm: 15 kHz MAS @ 100 K
- 1.9 mm: 24 kHz MAS @ 100 K
- 1.3 mm: 40 kHz MAS @ 100 K
- 0.7 mm: 65 kHz MAS @ 100 K

The fast MAS probes have optimized microwave coupling into the sample for high DNP efficiency with fast MAS.

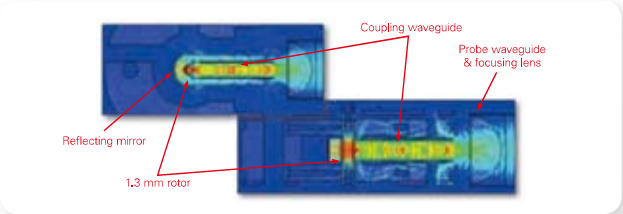


Fig. 2: EM simulations for 1.3 mm optimized DNP stator and waveguide at 263 GHz.

Fast MAS + DNP

As in conventional solid-state NMR, fast magic angle rotation enables superior decoupling of dipolar interactions, often provides favorable relaxation properties and can even allow for ^{1}H-detection. Combined with large signal enhancements from DNP, this has opened up new applications in structural biology and materials science.

1.3 mm DNP probes provide ideal sensitivity for limited-quantity samples. As in the case of a ^{13}C,^{15}N-specifically amino acid labeled dihydrofolate reductase, 4 μL of sample at a concentration of 0.65 mM were sufficient to acquire a ^{1}H-^{13}C heteronuclear correlation spectrum in just 26 minutes.

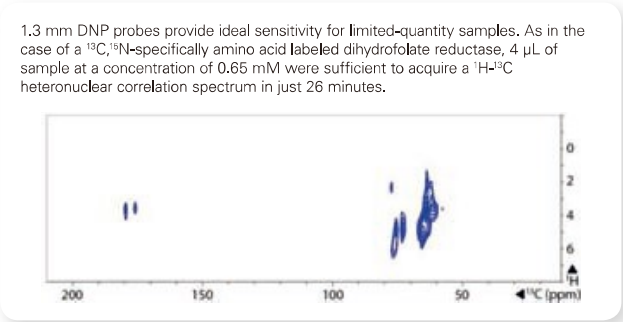


Fig. 3: ^{1}H-^{13}C HETCOR spectrum of specifically-^{13}C,^{15}N-labeled dihydrofolate reductase at a concentration of only 0.65 mM (2.6 nanomoles of protein in rotor), enhanced with 20 mM TOTAPOL in a 3:7 v/v glycerol-d_8/D_2O buffer, 40 kHz MAS.

Summary

- Turn-key solution for DNP-enhanced solids NMR experiments at high field.
- Unique high power CW gyrotron microwave sources at 263, 395, 527, 593 GHz.
- Klystron microwave source option at 263 GHz for increased DNP accessibility.
- Low-temperature (100 K) MAS probe technology with built-in waveguide and cold spinning gas supply.
- High DNP signal enhancements on wide range of samples.

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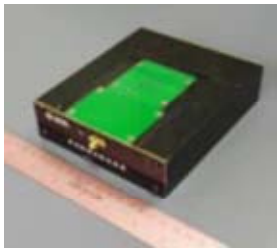

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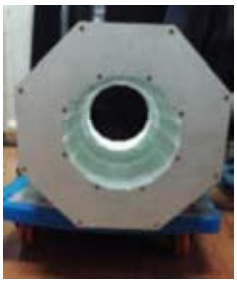

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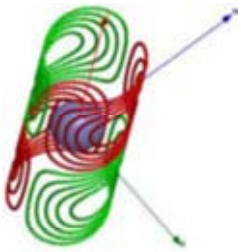

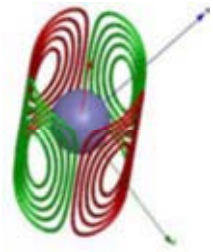

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