

公開セミナー

主催：新潟大学 医療化学コア・ステ準備委員会
後援：(公)内田エネルギー科学振興財団
日時：2025 年 11 月 19 日 13:00-14:00
場所：新潟大学 五十嵐キャンパス 物質生産棟 161
演題：**Applications of EPR Spectroscopy**
演者：**Prof. Dr. Sun Hee KIM**



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概要： Electron Paramagnetic Resonance (EPR) spectroscopy is a magnetic resonance technique that enables the characterization of structures and the study of dynamics in paramagnetic species. This electron-spin-based spectroscopic method provides unique and complementary information, making EPR a powerful analytical tool. In particular, advanced multi-technique approaches—such as Electron Nuclear Double Resonance (ENDOR), Electron Spin Echo Envelope Modulation (ESEEM), and Hyperfine Sublevel Correlation (HYSCORE)—combined with multi-frequency EPR, extend the capabilities of conventional CW-EPR, offering deeper insights into the structures and dynamics of biologically and materially relevant paramagnetic systems.

The **Advanced EPR Laboratory at KBSI** is one of the largest EPR facilities in East Asia. Leveraging this powerful suite of spectroscopic tools, our research focuses on two main themes:

1. Elucidating the effects of metal ions on amyloid- β peptide fibrillization relevant to Alzheimer's disease.
2. Investigating biomimetic catalytic mechanisms—from well-defined molecular complexes to nanomaterials—that emulate nature's catalytic processes.

In this talk, I will introduce the principles and techniques of EPR spectroscopy and highlight several case studies demonstrating the applications of advanced EPR methods, with particular emphasis on recent results from our laboratory. [1-10]

1. "Spectroscopic Capture of a Low-spin Mn(IV)-oxo Species in Ni-Mn₃O₄ Nanoparticles during Water Oxidation Catalysis". *Nat. Commun.* **2020**.
2. "Enhanced Redox Reactivity of a Nonheme Iron(V)-Oxo Complex Binding Protons". *J. Am. Chem. Soc.* **2020**, 142, 15305.
3. "Enzyme Mimetic Active Intermediates for Nitrate Reduction in Neutral Aqueous Media". *Angew. Chem. Int. Ed.* **2020**, 59, 2
4. "Selective Electrocatalytic Reduction of Nitrite to Dinitrogen based on Decoupled Proton-Electron Transfer". *J. Am. Chem. Soc.* **2018**, 140, 2012-2015.
5. "Mechanistic Investigation of Water Oxidation Catalyzed by Uniform, Assembled MnO Nanoparticles". *J. Am. Chem. Soc.* **2017**, 139, 2277-2285.
6. "Mechanistic Insights into Tunable Metal-Mediated Hydrolysis of Amyloid- β Peptides". *J. Am. Chem. Soc.* **2017**, 139, 2234-2244.
7. "Synthesis and reactivity of a mononuclear non-haem cobalt(IV)-oxo complex". *Nature Comm.* **2017**, 8, 14839.
8. "Multi-frequency, Multi-technique Pulsed EPR Investigation of the Copper Binding Site of Murine Amyloid β Peptide". *Angew. Chem. Int. Ed.* **2015**, 54, 1561-1564.
9. "Pulsed ENDOR Characterization of Copper Coordination of an Amyloid β Peptide Relevant to Alzheimer's Disease". *Angew. Chem. Int. Ed.* **2013**, 52, 1136-1142.
10. "Structural and Conformational Dynamics of Self-Assembling Bioactive β -Sheet Peptide Nanostructures Decorated with Multivalent RNA-binding Peptides". *J. Am. Chem. Soc.* **2012**, 134, 16047-16053.

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