DATE: Day 15 Month 6 Year 2018

SUMMARY of
2017 RESEARCH RESULTS REPORT
For International Collaborative Research with IPR, Osaka University

Research Title		Solid-state NMR Studies on Bone and other biomaterials
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	Present Title	Professor
Research Collaborator (Host PI)		Toshimichi Fujiwara

Summary

Solid-state NMR provides structural information of biological systems in unoriented solids such as biological membranes and fibers which are not amenable to X-ray crystallography owing to difficulties in forming well-ordered crystals. However, applicability of the NMR to biologically important macromolecular complexes is primarily limited by the sensitivity of NMR. Therefore, we apply recent technologies, high-field dynamic nuclear polarization (DNP) and high-speed magic angle spinning, to the sensitivity enhancement of solid-state NMR available at Institute for Protein Research, Osaka University.

We performed the following high-resolution solid-state NMR experiments at the static magnetic fields of 14.1 and 16.4 T.

1) Variable temperature high-speed MAS experiments on a membrane protein embedded in vesicles.
2) DNP based MAS experiments on a membrane protein embedded in vesicles.
3) Variable temperature MAS experiments on bone and bone-related materials.
4) DNP based MAS experiments on bone and bone-related materials.

To develop the application methods of DNP, we will prepare several novel bi-radial matrices for improving the affinity of radicals with protein samples in membranes and bones. We have conducted DNP-NMR experiments on bone including collagen. The method for preparation of bone with polarization agent TOTAPOL and AMUPOL was studied. The enhancement factor was about 20 at the temperature of 100 K under the submillimeter wave irradiation at 460 GHz.

***Deadline: May 18, 2018**
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