NMR/MRI Study of Superfluid ^{3}He in Aerogel

Y. Tanaka[a], R. Kado[b], S. Feat[a], R. Toda[a,c], R. Ito[a], M. Kanemoto[a], O. Ishikawa[b], and **Y. Sasaki**[a,c]

[a]Department of Physics, Graduate School of Science, Kyoto University, Kyoto, Japan
[b]Department of Physics, Graduate School of Science, Osaka City University, Osaka, Japan
[c]Research Center for Low Temperature and Materials Sciences, Kyoto University, Kyoto, Japan

We have studied NMR properties of superfluid ^{3}He in aerogel with our state-of-the-art ULTMRI. In contrary to the case of bulk superfluid ^{3}He, A-like and B-like phases in aerogel showed hysteretic coexistence near the phase boundary without an artificial temperature nor field gradient across the sample. OCU group reported that two phases are separated in space.[1] To further investigate the coexistence state, we started MRI study of the coexistent state of superfluid ^{3}He in aerogel. Our MRI measurement indeed showed spatially separated coexistence of the two phases. The interface between two phases was stable as far as the temperature was kept constant. However a shape and reproducibility of the interface suggest that the coexistence is related to some inhomogeneity in aerogel.
Addition to the coexistent state, we found the suppression of superfluidity by adding extra amount of ^{4}He on the silica strands covered with 2.5 atomic layers of adsorbed solid like ^{4}He. We also found the existence of modified superfluid state near the surface of the aerogel. This new surface state behaves differently from the bulk state.

[1]Ishikawa *et al.*, AIP Conf. Proc. **850**, 233(2006); Kado *et al.*, J. Low Temp. Phys. **150**, 472(2008).