Knight-Shift Measurement and H_{c2} Suppression on Sr_2RuO_4 in a precisely Con-trolled Magnetic Field

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We have performed Knight-shift measurement on spin-triplet superconductor Sr_2RuO_4 under various magnetic fields to determine the *d*-vector direction, which is perpendicular to the spin direction of the Cooper pair, in the magnetic fields as well as a zero field. We employed the ^{101}Ru nuclear quadrupole resonance (NQR) to measure the Knight shift under small fields. Application of small fields splits the NQR signal, and the Knight shift is derived from the interval between two split peaks. We reported the Knight-shift results along the c-axis (K_c) and the RuO_2 plane (K_{ab}) in the superconducting (SC) state in small fields obtained by this technique [1,2]. The decrease of the Knight shift was not found in any field direction below T_c within the experimental accuracy. This result suggests that the spins of the SC pair directs to the applied magnetic fields in the measured fields (order of several hundred Oe), and implies that the spin-orbit interaction, which locks the *d*-vector to a crystal lattice, is so weak that the *d* vector can be rotated by small applied magnetic fields.

We also measured ^{17}O Knight shift in the high-field superconducting phase, which was suggested by the double transition in the specific-heat measurements [3]. The magnetic fields were applied exactly parallel to the RuO_2 plane within the accuracy of 0.5 degree, and the linewidth of ^{17}O-NMR was approximately 5 Oe in a field of 12.5 kOe. Although a tiny shift related to the superconducting diamagnetism was observed below $T_c(H)$, the decrease of the Knight shift and the change of the spectrum were not detected in the high-field phase. The implications of this result will be discussed.

The ac susceptibility has been measured to investigate the field and angle dependences of H_{c2} in a precisely controlled magnetic field. At low temperatures, H_{c2} suppression was observed within a small angle region parallel to the RuO_2 plane, which is consistent with the previous report [3]. Temperature dependence of the H_{c2} suppression will be reported in the presentation.

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