Study on Nuclear Spin Order and Quantum Fluctuation in Pt metal

2002 Fiscal Year Final Research Report Summary

Study on Nuclear Spin Order and Quantum Fluctuation in Pt metal

Research Project

Project/Area Number

12440100

Research Category

Grant-in-Aid for Scientific Research (B)

Allocation Type

Single-year Grants

Section

一般

Research Field

固体物性Ⅱ(磁性・金属・低温)

Research Institution

Kanazawa University

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2000 – 2002

Keywords

Nuclear Magnetism / NMR / Quantum Fluctuation / Relaxation Time

Research Abstract

To estimate a nuclear spin ordering temperature in enriched 195Pt metal, NMR measurements were perfonned for the enriched 195Pt metal thin wire specimen. From the NMR measurements, the temperature and field dependences of spin-lattice (T_1) and spin-spin relaxation times(T_2) were obtained. The value of Knight shift was also measured in enriched 195Pt metal. These measurements were also performed for the natural Pt metal thin wire which contains 33.8% 195Pt. Experimental results of the T_1 and Knight shift are same in both specimens. The T_2 in enriched sample is half of that in natural Pt specimen. This can be understood by the shorter distance among the nuclear spins in the enriched sample, resulting the stronger spin-spin interaction. But very interesting result is the field dependence of the T_2. We observed the four times larger field dependence of T_2 in the enriched sample than one in the natural Pt sample. At present we cannot explain this result.

The temperature dependence of the magnetization of the enriched 195Pt sample was measured by using a SQUID magnetometer. It shows rather large Curi-Weiss like temperature dependence. The similar temperature dependences of the magnetization were also observed in the 80% enriched l95Pt thin wire sample and also the natural Pt thin wire sample which was made by the same procedures as the enriched thin wire sample. The amount of the magnetization is proportional the number of the 195Pt nuclear spin. Curie-temperature was estimated to be 0.7K. The natural Pt metal thin wire made vy the ordinary method, did not show this large temperature dependence of the magnetization. We will investigate, the origin of this anomalous magnetic behavior in Pt metal.

Research Products (12 results)

All Other

All Publications

[Publications] Haruhiko Suzuki: "NMR study of enriched ^<195>Pt metal"Physica B. 329-333. 1101-1102 (2003)

[Publications] Satoshi Abe: "Hyperfine-Enhanced Nuclear Spin Order of PrPb_3"Physica B. 329-333. 637-638 (2003)

[Publications] Daisuke Takahashi: "Magnetic Properties of CeRu_2Si_2 at Ultra Low Temperatures"Physica B. 329-333. (2003)

[Publications] J.Xue: "Susceptibility Maximum of Niobium Metal"J. Low Temp. Phys.. 121. 127-136 (2000)

[Publications] D.Takahashi: "AC Susceptibility and static Magnetization of CeR_2Si_2 at small Magnetic Field and Ultra Low Temperatures"Phys. Res.. B67. (2003)

[Publications] H.Suzuki: "X-ray diffraction measurement below 1k"J. Low Temperature Physics. 128. 1-7 (2002)

[Publications] Haruhiko Suzuki, Eriko Kobayashi, Satoshi Abe, Irek Bukhamedshin, Alexander Egorov and Murat Tagirov: "NMR study of enriched ^<195>Pt metal"Physica B. 329-333. 1101-1102 (2003)

[Publications] Satoshi Abe, Daisuke Takahashi, Hitoshi Mizuno, Ayumi Ryu, Seiji Asada, Shumsun Naher, Koichi Matsumoto, Haruhiko Suzuki and Tetsuo Kitai: "Hyperfirie-Ebhahced Nuclear Spin Order of PrPb_3"Physica B. 329-333. 637-638 (2003)

[Publications] Daisuke Takahashi, Satoshi Abe, Hitoshi Mizuno, Toshiyuki Ogawa, Koichi Matsumoto, Haruhiko Suzuki and Yoshichika Onuki: "Magnetic Properties of CeRu_2Si_2 at Ultra Low Temperatures"Physica B. 329-333. (2003)

[Publications] J. Xue, Q. Zhou, H. Suzuki and S. Misawa: "Susceptibility Maximum of Niobium Metal"J. Low Temp. Phys.. 121. 127-136 (2000)

[Publications] D. Takahashi, S. Abe, D.A. tayurskii, K. Matsumoto and Y. Onuki: "Ac Susceptibility and Static Magnetization Measurements of CeRu_2Si_2 at Small Magnetic Fields and Ultra Low Temperatures"Phys. Rev.. B67. (2003)

[Publications] H. Suzuki, S. Naher, T. Shimoguchi, A. Ryu and H. Fujishita: "*X-ray Diffraction Measurement below 1K"J. Low Temp. Phys.. 128. 1-7 (2002)

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