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ポスター発表

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Magnetostriction of the 2D Orthogonal Dimer Spin System SrCu$_2$(BO$_3$)$_2$

under Pulsed High Magnetic Fields

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I attended the conference on 24th International Conference on Low Temperature Physics (LT24) which was held on the Hilton in the Walt Disney World Resort in Lake Buena Vista, Florida from August 10 to 17, 2005. LT24 bring together experts for interdisciplinary and critical discussions of recent advances in those areas of science and technology in low temperature physics. The program covered a wide range of phenomena in physics, chemistry, geology and biology. At the conference, I made a poster presentation entitled “Magnetostriction of the 2D Orthogonal Dimer Spin System SrCu$_2$(BO$_3$)$_2$ under Pulsed High Magnetic Fields” on August 12.

[outline of the poster presentation]

We have investigated the low-dimensional quantum spin systems in high magnetic fields by means of magnetostriction measurements. Many interesting phenomena, such as the magnetization plateau and field-induced magnetic ordering, are observed in the spin gap systems in high magnetic fields. The magnetostriction is direct information of the lattice distortion that should coincide with the field induced phase transitions, where the spin-lattice coupling plays an important role to stabilize such field-induced states. The magnetostrictions of spin gap compound SrCu$_2$(BO$_3$)$_2$, have been measured using a strain gauge technique which is easy to introduce to extreme conditions such as pulsed high magnetic fields. We have successfully observed the structural deformation corresponding to the phase transition of each compound.

On SrCu$_2$(BO$_3$)$_2$, there is almost no length change below about 11T. The magnetostriction begins to increase monotonically from 11T to about 35T. There is a hysteresis as well as the magnetization curve. There is no anomaly at the field region of the 1/8 magnetization plateau in the magnetostriction. The magnetostriction curve has a plateau from 35T to 43T where the 1/4 magnetization plateau appears and the length change over 43T is very small. It has no jump at 35T and 43T where the magnetization jump. It is suggested that lattice deformation is a bit from the field range of the 1/4 plateau to one of the 1/3. These results seem consistent with that the existents of the superstructure stabilizing the magnetization and that the 1/3 and 1/4 plateaus have magnetic superstructures of the same form. We can observe the change of the structure at each plateau indirectly by measuring the magnetostriction.