X-ray Diffraction and Absorption Study under Strong Pulsed Magnetic Fields

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Diffraction experiments under non-ambient conditions have been developed for decades. Nowadays x-ray experiments over 100 GPa can be carried out using a diamond anvil cell. For ultra-low- temperature experiments, neutron and x-ray experiments below a few hundred mK are performed at several places. In contrast, diffraction experiments under strong magnetic field are limited below about 20T.

Recently, we have developed very small pulsed magnets [1]. Typical dimensions of the coils are 20 mm in diameter and 25 mm in length. Hence, the coil is readily attached to the cold head of a conventional closed cycle refrigerator, and is easily installed in a conventional x-ray diffractometer. Although the coils are small, magnetic fields above 30 T can be generated. Using this miniature coil and intense synchrotron x-rays, we conducted x-ray diffraction experiments under strong pulsed magnetic fields at beamline BL22XU at SPring-8. The field induced structural phase transition around 9 T in $Pr_{0.6}Ca_{0.4}MnO_3$ and the valence transition around 26 T in $YbInCu_4$ were clearly observed. Our new plan for x-ray absorption experiments under pulsed magnetic fields is also presented.

[1] Matsuda Y.H., et al., *Physica B*, 2004, **346-347**, 519.

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