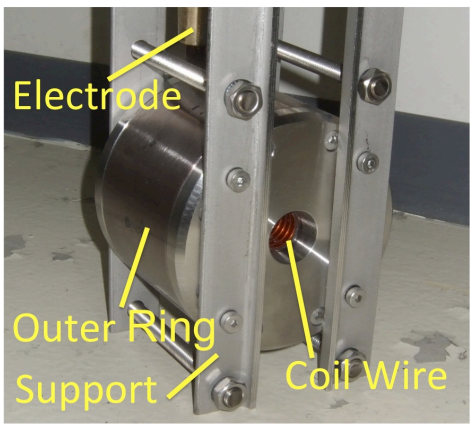
Neutron Diffraction in Pulsed Magnetic Fields

H. Nojiri[1#], Y. Narumi[1], T. Kihara[1], K. Ohoyama[1] and K. Kuwahara[2]

[1]*Institure for Materials Research, Tohoku University, Sendai, 980-8577, Japan*
[2]*Graduate School of Science and Engineering, Ibaraki University, Mito, 310-8512, Japan*

 # corresponding author: E-mail nojiri@imr.tohoku.ac.jp

In frustrated magnets, varieties of exotic states are induced by high magnetic fields and neutron diffraction is the most unique method to determine related magnetic structures. We report the most recent results of neutron diffractions by using pulsed high magnetic fields in the range of 30- 40 T. The system can be categorized into (1)a compact portable 30 T system and (2) a middle size system generating 40 T installed at J-PARC.



The portable system has been used in both reactor and spallation sources including ILL, SNS, ISIS and JRR3. In reactor sources, a very week magnetic peak can be detected for low background and the continuous field variation of the peak intensity is obtained. In spallation sources, multiple Bragg peaks are monitored by using white-beam-Laue-method. This is very useful to trace the change of magnetic wave vectors in incommensurate-commensurate transitions. Moreover, the handling of relationship between the time-dependent magnetic field and the time dependent white neutron beam enables us to observe different magnetic phases in a single setting.

We have used the systems to examine the magnetic phase diagrams of multi-ferroic compounds including $MnWO_4$, $TbMnO_3$ and $BiFeO_3$ and determined the magnetic structures of the field induced magnetic phases. It is very useful to study the origin of electric polarizations in different materials. In the presentation, most recent progresses of high magnetic neutron diffractions and the future developments will be summarized.