

The Current Status of iMATERIA, neutron powder diffractometer in J-PARC

- A trial neutron diffraction measurement for small quantities samples and large neutron absorption samples -

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iMATERIA ((IBARAKI Materials Design Diffractometer) [1] is a high throughput-versatile neutron diffractometer in J-PARC, build by Ibaraki prefecture, the local government of the area where J-PARC sites). It covers the d in range $0.18 < d (\text{\AA}) < 5$ with $\Delta d/d = 0.16 \%$ at high resolution bank, and $5 < d (\text{\AA}) < 40$ with the resolution changing gradually at two detector banks of 90 degree, and low angle. So, this diffractometer covers very wide d -range ($0.18 < d (\text{\AA}) < 40$). If the small angle detector bank will be available, which is currently under commissioning, iMATERIA will cover wider d -range ($0.18 < d (\text{\AA}) < 800$). It takes several minutes to obtain a ‘Rietveld-quality’ data for the X-ray laboratory sized sample measured at 1MW. Currently, the beam power is limited for tuning the accelerator ($\sim 300\text{kW}$), so that the measuring time is about 10 to 20 min for about 1g of standard oxide samples. The automatic sample changer system [2] is most important sample environment for high throughput experiments. The automatic sample changer system consisted of large number of sample storage and two lines of elevating system, pre-vacuum chambers and sample rotating tables. So, this we can handle more than 600 samples continuously at room temperature without breaking a vacuum of sample chamber.

The beam power became higher than before, it is possible to measure the small quantities (few mg) samples and the sample containing large neutron absorption elements for about one day beamtime. It is succeeded to execute Rietveld analysis for 4.5mg LiCoO₂ sample for 20h measurement time at 300kW beam power. The result of another example will be shown in presentation.

References

- [1] T. Ishigaki and A. Hoshikawa *et al.*, Nucl. Instr. Meth. Phys. Res. A **600**, 189 (2009).
- [2] A. Hoshikawa *et al.*, J. Phys.: Conf. Ser. **251** 012083-(2010)