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First automatically coaligned crystals for inelastic neutron experiments

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Inelastic neutron scattering is very useful experimental method used across all scientific fields. It is mainly used for uncovering the dynamics and excitations in single crystals. Although very powerful method inelastic neutron scattering suffers from low flux scattered from sample. This can be improved by increasing volume of sample.

Traditionally, experimental physicist are coaligning big amount of single crystals in order to have higher inelastic signal [1]. This process is very time consuming and demanding [2]. For this reason the Automatic Laue Sample Aligner (ALSA) was developed.

Here we present the results of the first automatic coalignment process. We have prepared triangular lattice antiferromagnet $\text{Na}_2\text{BaMn}(\text{PO}_4)_2$ by the flux growth method. The crystals are typically $1\text{-}4\text{mm}^2$ plates with well defined hexagonal c -axis, but a and b -axis is not possible to determine by eye, rising needs for using Laue diffractometer. ALSA robotic machine successfully coaligned 200 crystals with mass 2g and overall mosaicity spread below 1.5° . The quality of coalignment was checked by scanning the plates using X-Ray Laue and also using neutron Laue technique on OrientExpress [3]. This sample was later used for investigation of the spin excitations using Cold neutron 3-axis spectrometer IN12.

[1]Chang Liu et al., Phys. Rev. Lett. 128 (2022) 137003.

[2]Private communication, Huiqian Luo.

[3]Ouladdiaf, B., et al., Physica B: Condensed Matter 385 (2006) 1052-1054.

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