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Exotic Physics in Neutron Laue Diffraction

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Laue diffraction at steady-state neutron sources has been reborn thanks largely to the success of X-ray Laue diffraction for protein crystallography at synchrotrons and to the development of efficient large-area neutron-sensitive image-plate detectors. The Laue technique with thermal neutrons is especially successful for crystallography on single crystals with volume typically 0.1 mm3 [1], and is opening neutron diffraction to fields of structural chemistry previously deemed impossible [2].

The high-resolution volumetric view of reciprocal space is particularly advantageous in the detection of phase changes, incommensurability, and twinning, but does come at a price though: all scattering from the sample, inelastic as well as elastic, contributes to the observed Laue patterns. This can however reveal valuable physical information about the sample beyond the crystal structure, but careful analysis is required to extract the details in the two-dimensional projection intrinsic to Laue patterns.

Examples of exotic physics in neutron Laue diffraction experiments on KOALA on the OPAL reactor, and presented here, include:
• Observation of phonon scattering and determination of sound velocities
• Separation of Bragg and thermal-diffuse scattering in perfect crystals
• Observation of magnon scattering
• Double diffraction and multiple scattering in experiments with diamond-anvil cells [3]
• New phases in an aperiodic composite [4]

References
[1] G.J. McIntyre *et al.*, *Physica B* **385-386** (2006) 1055-1058
[2] A.J. Edwards, *Aust. J. Chem.* **64** (2011) 869-872
[3] J. Binns *et al.*, *IUCrJ* **3** (2018) 168-179
[4] S. Zerdane *et al.*, *Acta Cryst. B* **71** (2015) 293-299

Speakers Gender

Male

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No

Level of Expertise

Expert

Do yo wish to take part in the poster slam

No

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