

## Energy Materials and Neutron Reflectometry at ANSTO

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Neutron reflectometry is a powerful technique for studying the thickness and composition of films and multilayer systems. ANSTO currently has one operating reflectometer (PLATYPUS) and another that is currently early in the installation stage (SPATZ, formerly BioRef from HZB). There is also a suite of supporting infrastructure for characterisation and fabrication including: X-ray reflectometry, imaging ellipsometry, spin-coating, Langmuir-Blodgett and Langmuir-Schaefer dipping, quartz-crystal microbalance with dissipation, etc. The combination of neutron instrumentation and ancillary equipment represents a world-class facility for studying thin-film materials, particularly those with energy applications. The scientific community have used the reflectometry facilities at ANSTO in collaboration with the reflectometry instrument scientists to characterise a range of energy materials including organic light-emitting diodes (OLEDs) [1, 2], hydrogen absorption [3], magnetic materials [4], and biopolymers [5]. The presentation will provide an overview of research achievements to date in characterising energy materials using reflectometry at ANSTO.

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### References:

- [1] McEwan, JA; Clulow, AJ; Shaw, PE; Nelson, A; Darwish, TA; Burn, PL and Gentle, IR, Diffusion at interfaces in OLEDs containing a doped phosphorescent emissive layer, *Advanced Materials Interfaces* 3(17), 1600184 (2016)
- [2] Smith, ARG; Lee, KH; Nelson, A; James, M; Burn, PL and Gentle, IR, Diffusion - the Hidden Menace in Organic Optoelectronic Devices, *Adv. Mater.* 24(6), 822-826 (2012)
- [3] Callori, S; Rehm, C; Causer, G; Kostylev, M and Klose, F, Hydrogen Absorption in Metal Thin Films and Heterostructures Investigated in Situ with Neutron and X-ray Scattering, *Metals* 6(6), Art. No. 125 (2016)
- [4] Callori, SJ; Bertinshaw, J; Cortie, DL; Cai, JW; Le Brun, AP; Zhu, T and Klose, F, 90° magnetic coupling in a NiFe/FeMn/biased NiFe multilayer spin valve component investigated by polarized neutron reflectometry, *J. Appl. Phys.* 116(3), Art. No. 033909 (2014)
- [5] Su, J; Raghuvanshi, VS; Raverty, W; Garvey, CJ; Holden, PJ; Gillon, M; Holt, SA; Tabor, R; Batchelor, W and Garnier, G, Smooth deuterated cellulose films for the visualisation of adsorbed bio-macromolecules, *Sci Rep* 6, 36119 (2016)