PELICAN –a Time of Flight Cold Neutron Spectrometer – Recent Scientific Highlights

Dehong Yu[a] and Richard Mole[a]

Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW 2234, Australia.

The time-of-flight direct-geometry neutron spectrometer, Pelican, has been serving the scientific community for many years with excellent outcomes [1]. The Pelican instrument was designed to meet the diverse requirements of the Australian scientific community from physics, chemistry, material science, to biology. A wide range of research fields is covered. These include crystal-field excitations, phonon densities of states, magnetic excitations for various multifunctional materials including high Tc superconductors, novel magnetic, thermoelectric, ferroelectric and piezoelectric materials; molecular dynamics in hydrogen-bonded and storage materials, catalytic materials, cements, soils and rocks; and water dynamics in proteins and ion diffusion in membranes. Polarized neutrons and polarisation analysis option makes the full use of the neutron spin to study magnetism and to separate the coherent and incoherent scatterings. To meet the demand of diverse user community, new sample environment equipment has been developed and commissioned including high pressure cell, in-situ light irradiation, fast dilution temperature cooling system and superconducting magnet. These new developments have significantly extended the instrument capabilities.

In this presentation, the recent scientific outcomes of the instrument will be demonstrated with several systems studied using quasi-elastic and inelastic neutron scatterings. These cover scientific areas including energy, magnetic and other novel materials [2-6].

[1] D. Yu, R. Mole, T. Noakes, S. Kennedy and R. Robinson, *J. Phys. Soc. Jpn.*, ***82***, *SA027 (2013)*.

[2] Bing Li, *et al.* ***Nature, https://doi.org/10.1038/s41586-019-1042-5***

[3] Q Y Ren, *et al.* ***Nature communications 13,2293, https://doi.org/10.1038/s41467-022-29997-9***

[4] Y X Yu, *et al*. ***Nature communications 13,3649, https://doi.org/10.1038/s41467-022-31349-6***

[5] Ji Qi, *et al.* ***Nature communications 11, 5197, https://doi.org/10.1038/s41467-020-19044-w***

[6] M. Fujihala, *et al*. ***Nature communications 11, 3429, https://doi.org/10.1038/s41467-020-17235-z***