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Magnetic Interface Phenomena in Nano-Architectures and their Applications

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Interfaces between heterostructure components in nanoscale films play important roles in communicating low-dimensional phenomena and act as anchor points for the direct control and tunability of device performance. In this talk I will give an overview of our group's recent investigations into the occurrence of magnetic interface phenomena in low-dimensional thin-film systems which have conceivable utility in future condensed-matter technologies. First, the magnetic interface quality of an FePt₃ nano-magnet formed via ion-induced chemical disorder will be analysed [1]. Here, neutron and electron measurements used in combination with density functional theory calculations reveal a rather counterintuitive result which could prove beneficial towards the development of ultra-high density magnetic recording devices. In a second study, the layer-averaged static magnetisation and macroscopic magneto-dynamic behaviours of a Co/Pd bilayer during hydrogen-gas cycling are analysed. To perform this characterisation, we first had to develop and commission an original sample environment which innovatively combines polarised neutron reflectometry and microwave spectroscopy [2]. The Co/Pd interface is found to feature tailorable magnetic surface anisotropy in the presence of hydrogen gas – the mechanism of which could act as a safety switch in next-generation vehicles powered by hydrogen.

[1] G. L. Causer, D. L. Cortie, H. Zhu, M. Ionescu, G. J. Mankey, X. L. Wang and F. Klose. ACS Appl. Mater. Interfaces, 10, 16216-16224 (2018)

[2] M. Kostylev, G. L. Causer, C.-H. Lambert, T. Schefer, C. Weiss, S. J. Callori, X. L. Wang and F. Klose. J. Appl. Cryst. 51, 9-16 (2018)

Topic

Advanced Materials

Primary author(s) : CAUSER, Grace (Australian Centre for Neutron Scattering)

Co-author(s) : Dr CORTIE, David (University of Wollongong); Dr ZHU, Hanliang (ANSTO); Prof. KOSTYLEV, Mikhail (University of Western Australia); IONESCU, Mihail (ANSTO); Prof. MANKEY, Gary (University of Alabama); Prof. WANG, Xiaolin (University of Wollongong); Prof. KLOSE, Frank

Presenter(s) : CAUSER, Grace (Australian Centre for Neutron Scattering)

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