



Contribution ID: 56

Type: **Oral Presentation**

MR: the polarized neutron reflectometer at China spallation neutron source

Tuesday, 15 October 2019 15:45 (25 minutes)

The multi-purpose reflectometer (MR) at China spallation neutron source (CSNS) is an instrument optimized for examining thin films with nanometer scale structure, especially in regard to their magnetic properties with the removable polarized neutron components. The MR has 3 choppers and 4-m-long bender. The main frame of wavelength is 2-7 Å. The first step of commission is finished in the end of 2018 [1].

So far, more than ten user proposals have been done, although the current beam power of CSNS is about 50 kW. By using the ^3He tubes as the preliminary detector, the lowest reflectivity of 10^{-5} can be reached. Meanwhile, 3 user's experiment papers have been published this year [2-4]. First, we report a polarized neutron reflectometry (PNR) study on NiFe/Pt/MgO thin film, which exhibited an enhanced inverse spin Hall effect when the thickness of Pt is below 3 nm [2]. Second, we report the magnetic reversal behavior of a ferromagnet (FM) coupled through an FeMn antiferromagnet (AF) to a pinned ferromagnet has been investigated by PNR measurements [3]. The results show that PNR is a technique sensitive to the compositional and magnetic depth profiles of multilayer samples. Finally, we will mention the applications of Neutron Reflectometry (NR), such as the probing the migration of helium atoms at the interface in He⁺ ion implanted W/Ni bilayer [4]. In brief, the MR at CSNS will accentuate the polarized/un-polarized neutron reflectivity with low background, which is a powerful technique to study the structures and magnetic structures of thin films.

References

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Session Classification: Instruments

Track Classification: Instrument