A test of MIEZE-Reflectometer for study of surface and interface

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Neutron Spin Echo (NSE) method is very powerful spectroscopy to investigate slow dynamics for condensed matter[1]. Neutron Resonance Spin Echo (NRSE)[2] is a variant of the NSE technique that replaces Larmor precession field by two neutron resonance spin flippers (RSFs). We installed MIEZE spectrometer to C3-1-2-2(MINE1) port at JRR-3M in JAEA[4]. MIEZE spectrometer is one of NRSE and there is no optical component between sample and detector. It is well suited to small angle neutron scattering method[3] and reflectometry[5]. By combining of neutron reflectometry and the MIEZE, it is possible to detect in- and quasi-elastic scattering on surface and interface. We installed MIEZE spectrometer to C3-1-2-2(MINE1) port at JRR-3M in JAEA. In this report, we show present status of MIEZE spectrometer and the feasibility of MIEZE reflectometer(Fig.1(a)). Three RSFs are used on the MIEZE spectrometer. These RSFs are set on bootstrap arrangement. There are two kinds of detector. The He-3 point detector is used to adjust the beam line and measure reflectivity by the sample. 2D-PSD is used for the MIEZE. The two dimensional position sensitive detector (2D-PSD) is to measure off-specular scattering since inelastic scattering component is in it. The 2D-PSD consists of 6Li enriched glass scintillator and a position sensitive photomultiplier in five inch diameter, in which position resolution is 1 mm. Magnetic guide field coil is set from the first DC-flipper to the analyzer to avoid depolarization of neutron spin. The length between RSF3 and 2D-PSD is 0.5 m. The frequency of RSFs is 600 kHz. Fourier time is estimated to be 1 ns ($\sim 0.6 \text{ eV}$). Fig.1(b) show measured $P_{\text{NSE}}$ of specular reflection from m=7 NiC/Ti supermirror as a function of incident angle. There is no decay of $P_{\text{NSE}}$, we have succeeded in measuring standard elastic samples for MIEZE reflectometer in which Q is up to 0.135 nm$^{-1}$ in which frequency.

References
Fig. 1. (a) Photograph and schematic layout of MIEZE installed at MINE1. (b) Measured PNSE of specular reflection from m=7 NiC/Ti supermirror as a function of incident angle.