

Development of resonance spin flipper for NRSE spectrometer at pulsed source

Masaaki KITAGUCHI¹, Masahiro HINO¹, Yuji KAWABATA¹, Hirotohi HAYASHIDA²,
Seiji TAsAKI², Ryuji MARUYAMA³, Dai YAMAZAKI³, Toru EBISAWA³

¹Research Reactor Institute, Kyoto Univ., Kumatori, Osaka, Japan

²Dep. of Nucl. Eng., Kyoto Univ., Kyoto, Japan

³JAEA, Tokai, Ibaraki, Japan

E-mail for corresponding author: kitaguch@rri.kyoto-u.ac.jp

Neutron resonance spin flipper with high frequency oscillating magnetic field for pulsed source was demonstrated. It enables us to develop a high resolution neutron resonance spin echo (NRSE) spectrometer[1] at pulsed source like J-PARC.

In NRSE, the two separated neutron resonance spin flippers (RSFs) replace a homogeneous static magnetic field for spin precession in the conventional neutron spin echo. The RSF consists of a static magnetic field in a well-defined region and an oscillating magnetic field in the static field. The energy resolution of NRSE spectrometer depends on the frequency of the oscillating field, which is proportional to the strength of the static field. We have made a new type of RSF which the strong static field and the high frequency oscillating field can be applied on[2]. The aluminum wires through which neutrons pass are not anodized in order to reduce the scattering from the surface. Pulsed neutrons with wide range of wavelength can be flipped by using RSF with modulated amplitude of the oscillating field. Test experiments have been performed at cold neutron beam line MINE1 at JRR-3M reactor in JAEA and beam line CN3 at KUR. The spin-flip probability was higher than 0.85 on the neutron wavelength from 0.3nm to 0.6nm and the RSF frequency of 516kHz. We are planning to construct NRSE instruments at J-PARC by using this type of RSF with high frequency up to 1MHz.

[1] R. Gähler, R. Golub, Z Phys. **B65**, 269 (1987).

[2] M. Kitaguchi et. al., Physica B, to be published (2006).