Spin current injection induced by ferromagnetic susceptibility in antiferromagnetic insulator NiO

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Spin current injection to various materials has been a hot issue in a field of Spintronics. Of particular recent interest is spin current propagation in antiferromagnetic insulators NiO. Being common material, antiferromagnetic insulators have practical advantage in material choice.Moreover,surprisingly,antiferromagnetic layer was found to enhance spin curent injection efficiency at T_N (Neel Temperature) [1,2]. It has been recently recognized that spin transport in antiferromagnets are possible due to antiferromagnets fluctuations represented by a propagation of a coupled two magnon modes [3,4].

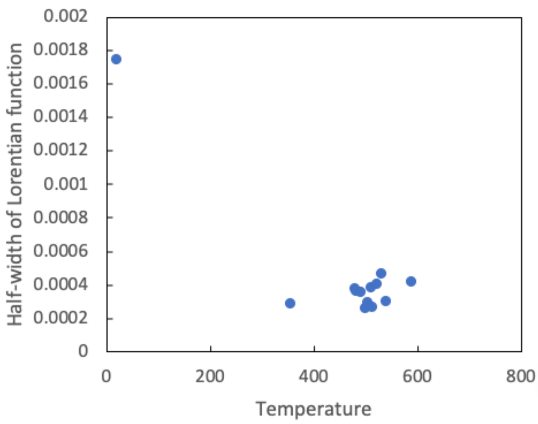
The objective of this experiment is to carry out neutron scattering experiment to study the ferromagnetic component of magnetic susceptibility of antiferromagnetic insulators to explore its behavior as function of temperature and to provide quantitative explanation for the spin transport experiments.

It was demonstrated recently that the spin current transmission efficiency is in fact the q-resolved ferromagnetic susceptibility of the antiferromagnet based on a microscopic theory[5]. The neutron scattering is therefore an excellent method to study the spin transport in spintronic devices.

In the present study, in order to confirm and to clarify magnetic components at ferromagnetic zone center, we performed measurements on an antiferromagnetic insulator NiO, the crystal made by FZ method, at around (1 1 1) of this material between 20 < T< 589K (mainly around 480 < T_N=525 <530K) of this material, by triple axis neutron diffraction instrument 4G (GPTAS).

we performed Longitudinal-scan at around (1 1 1) with a (h h l) scattering plane, and we could confirm nuclear scattering with a peak as a Gaussian function and magnetic scattering with a peak as a Lorentian function. If we can observe magnetic fluctuations that enhance the spin current, Half-width of Lorentian function increases at around T_N. Fig. 1. Shows Half-width of Lorentian function between 20 < T < 589K at around (1 1 1). In this measurement, we could not yet confirme increasing Half-width of Lorentian function around T_N. We need to scrutinize this measurement.

Fig. 1. Half-width of Lorentian function between 20 < T < 589K at around (1 1 1)



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