Measurement of XMCD and XAS of Pt in YIG/M/Pt
(M= Cr, $Ni_{80}Fe_{20}$, $Co_{90}Fe_{10}$, $Fe_{50}Co_{50}$ and Fe)

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The thermoelectric conversion by the spin Seebeck effect is an attractive technology due to a uniform structure [1, 2]. However, the generated voltage is too small for the practical use. Therefore, in order to enhance the generated voltage, we focus on the spin mixing conductance which has been theoretically reported to depend on the magnetic moment density [3]. We have successfully improved the generated voltage by inserting the ultra-thin magnetic layers, Cr, $Ni_{80}Fe_{20}$, $Co_{90}Fe_{10}$, $Fe_{50}Co_{50}$ and Fe, with the higher magnetic moment than YIG [4]. However, materials dependence of the generated voltage cannot been explained by their saturated magnetization. We suspected that the induced magnetic moment in Pt contributed to the improvement of the generated voltage. In this report, we showed the result of X-ray magnetic circular dichroism (XMCD) of Pt.

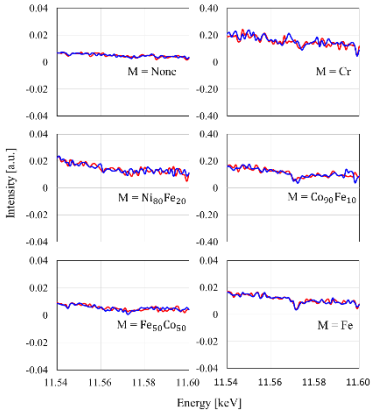

Figure 1. XMCD

The sample structure is YIG 1[mm] / M 0.3[nm] / Pt 1[nm] (M= Cr, $Ni_{80}Fe_{20}$, $Co_{90}Fe_{10}$, $Fe_{50}Co_{50}$ and Fe). Figure 1 shows XMCD spectra of Pt and it was found that all samples did not have the magnetic moment in Pt at all, which indicates that the induced magnetic moment in Pt is not the reason of the generated voltage improvement. Figure 2 shows the electronic state of Pt by X-ray absorption spectroscopy (XAS). We observed the sharp peak at 11.57 [keV] for YIG 1[mm] / Pt 1[nm], which is a characteristics of Pt oxidation at the interface of YIG/Pt. On the other hand, the peaks with magnetic insertion layers are lower than that without insertion layer. Therefore, it was found that the magnetic layer insertion reduced the Pt oxidation at the interface between Pt and YIG.

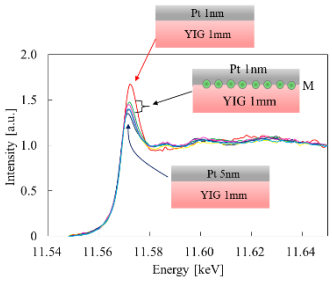

Figure 2. XAS

References

[1] K. Uchida *et al.*: Nature **455** 778(2008). [2] A. Kirihara *et al.*: Nature materials **11** 686 (2012). [3] X. Jia *et al.*: Europhys. Lett. **96** 17005 (2011). [4] R. Nakamura *et al.*: 第 64 回応用物理学会春季学術講演会　講演予稿集 14p-P10-76