YIG/Ta or Pt スピンゼーベック素子における Ru 挿入効果
Ru insertion effect on spin Seebeck effect of YIG/Ta or Pt

九大シス情 [1], JST PRESTO [2] ○李厚霖 [1]，新村拓未 [1]，中田記矢 [1]，黒川雄一郎 [1]，
湯浅裕美 [1,2]
[1]Kyushu Univ. [2]*JST PRESTO* ○Houlin Li [1], Takumi Niimura[1], Fumiya Nakata[1],
Yuichiro Kurokawa[1], Hiromi Yuasa[1,2]
E-mail: lihoulin@mag.ed.kyushu-u.ac.jp

Introduction

Spin Seebeck effect and inverse spin Hall effect can realize the thermoelectric generator in a uniform structure. However, it is necessary to increase Spin Seebeck coefficient for practical use. We have reported improvement of Spin Seebeck coefficient by inserting Ru layer at the interface of YIG and Ta [1]. Since there is possibility of Ru oxidization at the interface with YIG, we compare the metallic Ru and the intentionally oxidized RuO effects on the spin Seebeck coefficients and concluded the metallic Ru improved spin Seebeck coefficient [2]. In this report, we focus on the metallic Ru insertion effect on Spin Seebeck coefficient.

Experimental method

We used Silicon as substrate and fabricated YIG layer on substrate by RF sputtering. The sample with YIG was annealed under 750℃ for one hour. Ru and Ta deposited on those YIG films by DC sputtering. The sample structure is Si/YIG(50nm)/Ru(tnm)/Ta or Pt(4.5nm) as show in Fig.1. The inserted Ru thickness *t* is varied from 0nm to 1.1nm. Measurement systems were shown in Ref. [1][2].

Results and discussion

Fig.2 shows the spin Seebeck coefficient dependence on the Ru thickness. The spin Seebeck coefficient for YIG/Ru/Ta samples increased as Ru thickness increased although the total resistance decreased. The optimum thickness was 0.9nm. On the other hand, YIG/Ru/Pt samples did not show the obvious change with Ru thickness. The combination of Ru/Ta is preferable with compared to Ru/Pt. It is supposed that Ru/Ta interface possesses the good condition of spin current generation and spin Seebeck coefficient enhancement.

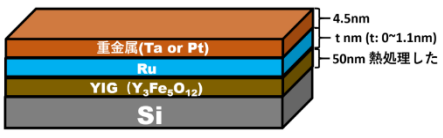

Fig.1 Structure of samples

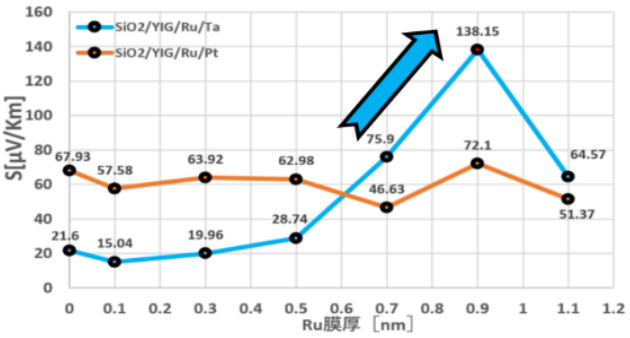

Fig.2 Spin Seebeck coefficient with different Ru layer thickness

[1] Li et al.: The 65th JSAP autumn meeting 18P-PB1-25 (2018).
[2] H. Yuasa, F. Nakata, R. Nakamura and Y. Kurokawa, J. Phys. D Appl. Phys. 51 (2018) 134002.