

YIG/非磁性金属(Ta,W,TaW)の二層膜における界面酸化状態

Oxidation state of non-magnetic material (Ta,W,TaW) contacted YIG

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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. We confirmed that Pt was slightly oxidized [3], which suggests that Ta, W and TaW with the high spin Hall angle materials are oxidized. We report the oxidation state of Ta, W and TaW by X-ray photoelectron spectroscopy (XPS).

Figure 1 shows XPS spectra of non-magnetic material (Ta, W, TaW) in the structure of YIG / Ta / Al and YIG / W / Al and YIG / TaW / Al. Al was sputtered as a result, although Ta was oxidized, W was not oxidized for all structure. Figure 2 shows the spin Seebeck coefficient S of YIG 1[mm] / TaW 5[nm], YIG 1[mm] / Ta 0.4[nm] / TaW 4.6[nm] and YIG 1[mm] / W 0.4[nm] / TaW 4.6[nm] [4] where the interface material was changed. It was found that YIG / W / TaW shows the higher S than YIG / TaW, and YIG / Ta / TaW shows the lower S than YIG / TaW. It means that the higher amount of W at the interface with YIG has the higher S , which corresponds to the oxidization states observed by XPS.

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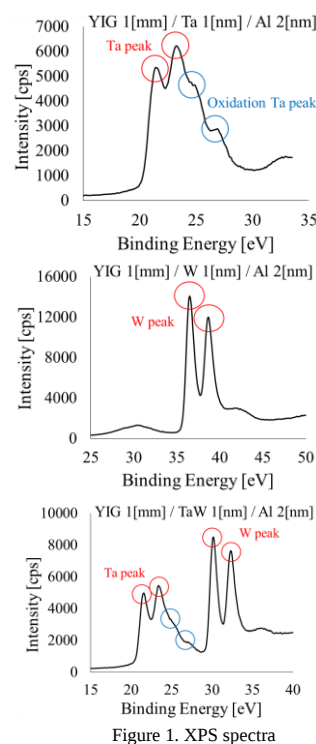
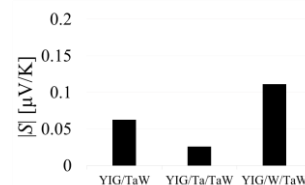


Figure 1. XPS spectra

Figure 2. spin Seebeck coefficient S