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Structural, magnetic and transport properties of $(Mn_{1-x}Co_x)_2VGa$ thin films prepared by magnetron sputtering

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$(Mn_{1-x}Co_x)_2VAl$ is a half metal full Heusler alloy which is predicted to be an anti-ferromagnetic phase when x = 0.5 [1]. In that material, the magnetic moments of Co and V are coupled in antiparallel with the Mn one. $(Mn_{1-x}Co_x)_2VGa$ is also expected to be anti-ferromagnetic because valence electron number of Ga is the same as that of Al. An anti-ferromagnetic Heusler alloy can be expected to be a new material which is applied for a spin valve. In this work, we investigated Co-composition dependence of magnetic properties for the $(Mn_{1-x}Co_x)_2VGa$ epitaxial films.

$(Mn_{1-x}Co_x)_2VGa$ thin films were prepared on MgO (100) substrates at 700ºC by magnetron sputtering. Film composition was adjusted by co-sputtering technique from Co 0% to 35%. Structural, magnetic, and transport properties of the films were measured by using x-ray diffractometer (XRD), Vibrating Sample Magnetometer (VSM) and van der Paw technique, respectively.

Fig. 1 shows the XRD results of the samples which have various Co compositions. (002) diffraction which comes from *B*2 phase was confirmed for all the samples. However, the unknown peak is observed for samples over Co 20%. Fig. 2 shows VSM results of the samples with Co 0, 20, 25%. With increasing Co concentration, saturation magnetization decreased. At Co concentration of 25%, the hysteresis loop is disappeared. Therefore, the Co 25% sample is anti-ferromanetic or low T_c ferrimagnetic material. Transport properties measured by van der Paw technique and results of the magnetic circular dichroism (MCD) measurement using synchrotron x-ray source will be discussed in the presentation.

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[1] I. Galanakis *et al*, PHYSICAL REVIEW B **75**, 092407 (2007)

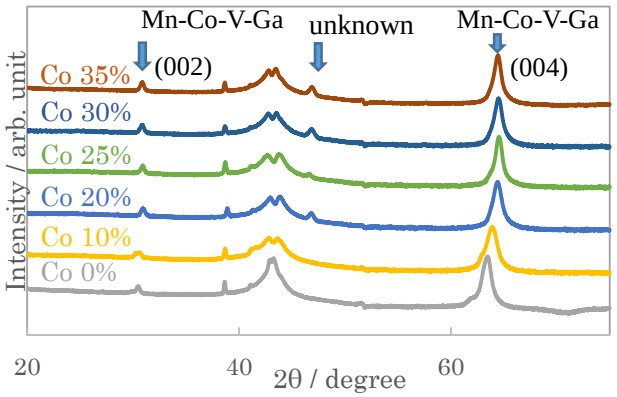

Fig. 1 XRD results of $(Mn_{1-x}Co_x)_2VGa$ which have various Co compositions. Peaks without index numbers are from substrate or background of the system.

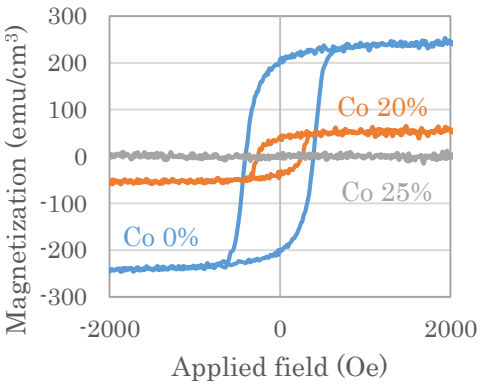

Fig. 2 *M-H* curves of $(Mn_{1-x}Co_x)_2VGa$ films with Co 0, 20, and 25 at.%, at R.T.

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