Substitution Effect on the Magnetic Transitions of Fe_2MnSi

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The Heusler compound Fe_2MnSi shows intriguing magnetic properties. It exhibits a ferromagnetic transition at $T_C \sim 220$ K, and, below, another magnetic transition at $T_R \sim 65$ K, which is supposed to be a ferrimagnetic transition. In the present study we investigate the effects of the substitution of Co and V for Fe and Mn, respectively, on these transitions. They are interesting because the end compound Co_2MnSi is considered to be a half-metallic ferromagnet and, moreover, the compounds $(Fe_{1-y}Co_y)_2MnSi$ for larger y ($\gtrsim 0.5$) were shown to be candidates for half-metals.[1] Another end compound Fe_2VSi exhibits an antiferromagnetic transition. These transitions of $(Fe_{1-y}Co_y)_2MnS$ ($y \leq 0.1$) and $Fe_2Mn_{1-x}V_xSi$ ($x \leq 0.2$) are investigated with the measurement of magnetization and electrical resistivity. The substitution for either case leads to decreasing T_R and increasing T_C. For $(Fe_{1-y}Co_y)_2MnSi$ T_R appears to vanish at $y \sim 0.07$. For $Fe_2Mn_{1-x}V_xSi$ T_R appears to vanish in the vicinity of $x \sim 0.2$. For $Fe_2Mn_{1.8}V_{0.2}Si$ from resistivity measurement in magnetic field T_R is found not to vanish and to be ~ 6 K at 0 T, and decreases with increasing magnetic field. The destruction of this transition is estimated to occur at ~ 6 T.

[1] Y. Kondo *et al.*, J. Phys.: Conf. Ser. **150**, 042099 (2009).