Magnetic properties of half-metallic semi Heusler Co$_{1-x}$Cu$_x$MnSb compounds

A study of the half-metallic character of the semi Heusler alloys Co$_{1-x}$Cu$_x$MnSb (0≤x≤0.9) is presented. We investigated the saturation magnetization $M_S$ at temperatures from 5K to room temperature and the temperature dependence of the DC magnetic susceptibility $\chi$ above Curie temperature $T_C$. The magnetic moments at 5K, for most compositions are very close to the quantized value of 4μB for Mn$^{3+}$ ion, the compound with 90% Co substituted by Cu is still ferromagnetic with $M_S(5K)=3.78\mu_B$/f.u. These results emphasize the role of Co atoms in maintaining the ferromagnetic order in the material. The Curie temperature is decreased from 476K to about 300K as the Cu content increases from 0% to 90%. Above $T_C$, the $\chi^{-1}$ vs $T$ curves follow very well the Curie–Weiss law. The effective moment $\mu_{eff}$ and paramagnetic Curie temperature $\theta$ are derived. A comparison between the values of $M_S$ at 5K and $\mu_{eff}$ shows a transition from localized to itinerant spin system in these compounds.

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