Mn$_2$-type Heusler compounds as possible half-metallic fully compensated ferrimagnets

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We show detailed theoretical and experimental investigations on the electronic and magnetic properties of the Heusler compounds Mn$_{2-x}$Co$_x$VAl with L2$_1$ structure and of the Mn$_2$Co$_{1-x}$V$_x$Al with Hg$_2$CuTi structure type, respectively. Polycrystalline samples have been examined by X-ray and neutron diffraction and by magnetization measurements. The degrees of the atomic ordering have been evaluated from the intensity ratios of the X-ray patterns by using the Takamura's model. The Curie temperatures decrease with Co content in L2$_1$ compound, ranging between 770 K (x = 0) and 254 K (x= 1). Magnetization measurements are consistent with those predicted by Slater-Pauling rule. In addition, electronic band structure has been determined theoretically using the KKR Green's function method and the substitutional disorder was accounted for by the means of the Coherent Potential Approximation. Our study discuss the possibility to obtain a half-metallic fully compensated ferrimagnet (HMFi) in Heusler compound of Mn$_2$-type.