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Abstract (Document Summary)

We present experimental results of magnetization, resistance and specific heat, on single crystals of several Half Heusler alloys. In particular we focus on the 18 valence electrons $TiCoSb$ and $TiNiSn$ and their evolution from their non magnetic ground state to the metallic $TiFeSb$, $VCoSb$ and $TiCoSn$. Contrary to previous experimental results we find the ground state of $TiCoSb$ to be metallic but driven to semiconducting through disorder induced localization. In all samples studied we find that the semiconductor to metal transition occurs concurrently with a lattice parameter change. Ferromagnetic ordering appears to occur only if the Stoner criterion is satisfied and long range ordering occurs even in the presence of localized states. The transport behavior of all samples depends on the dimensional ratio [Special characters omitted.] corresponding to the ratio of the extent of localization to the bandwidth. Experimental results are also presented on the β - Ti_6Sn_5 compound which according to magnetization and specific heat measurements is very close to ferromagnetic instability. Ferromagnetic ordering occurs after minute amounts of doping with certain elements (La , Ce , Pr , Sm , Co) on the Ti site. Large values of the critical temperatures are observed which do not scale with the dopant dilution concentration. Experimental evidence is also presented on the existence of a ferromagnetic ground state for BaB_6 and La doped BaB_6 .

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