Crystal and magnetic structure investigation of Half-Heusler compounds $MnNi_{0.9}M_{0.1}Sb$ (M = Ti, V, Cr, Fe, Co)

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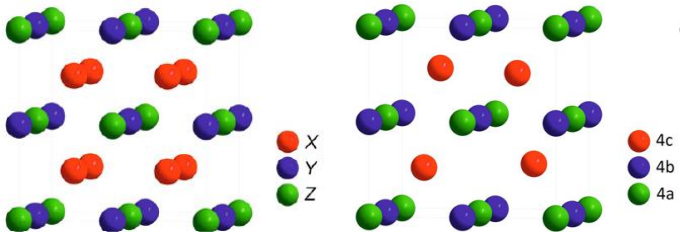
Heusler compounds

Heusler alloys **Half – Heusler alloys**

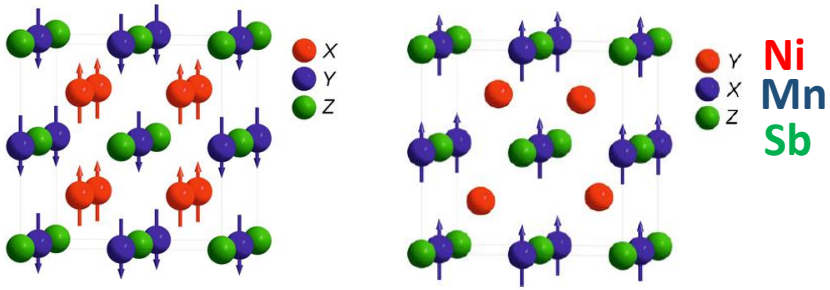
Cubic structure

X_2YZ $Fm\bar{3}m$ | XYZ $F\bar{4}3m$

Ni_2MnSb, Cu_2MnAl | NiMnSb; CuMnSb



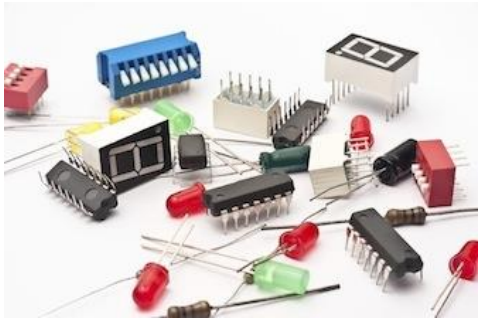
X_2YZ Magnetic structure XYZ



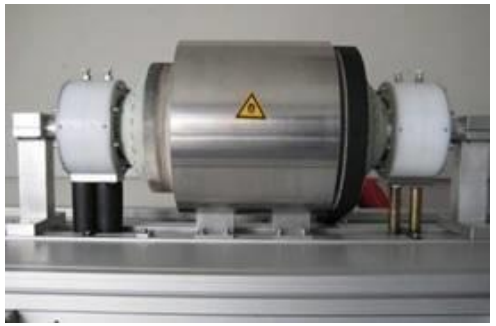
Application

Solar panels

Permanent magnets



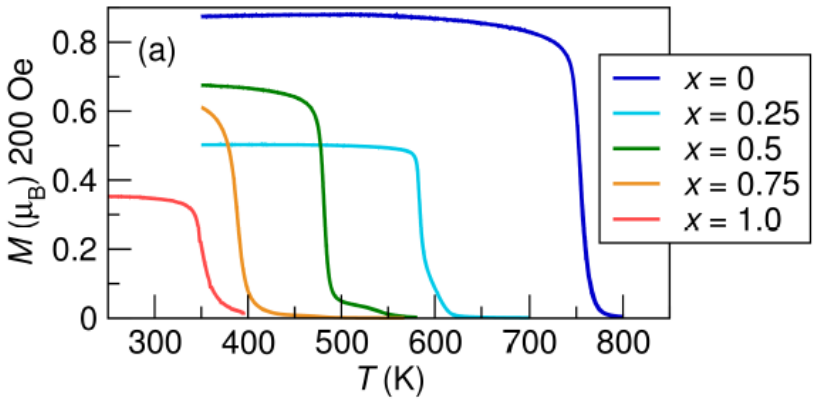
Electronics elements

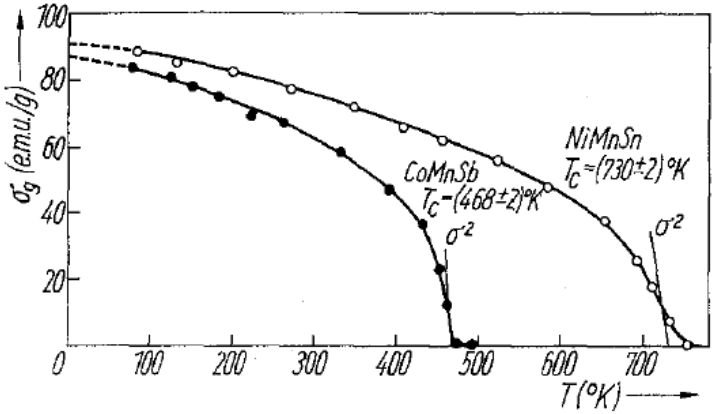


Refrigeratos

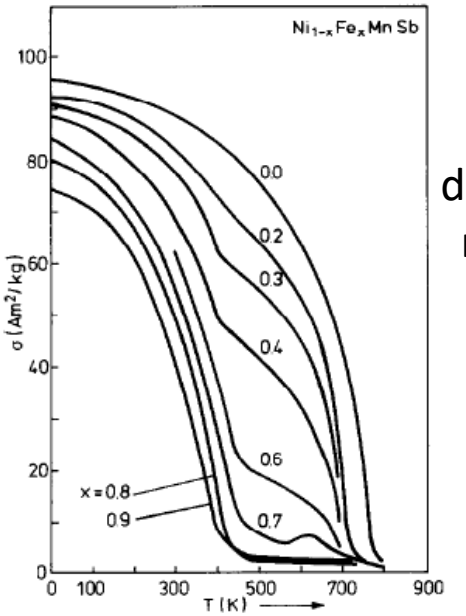
Half-Heusler compounds

$Ni_{1+x}MnSb$ (x= 0, 0.25, 0.5, 0,75, 1)

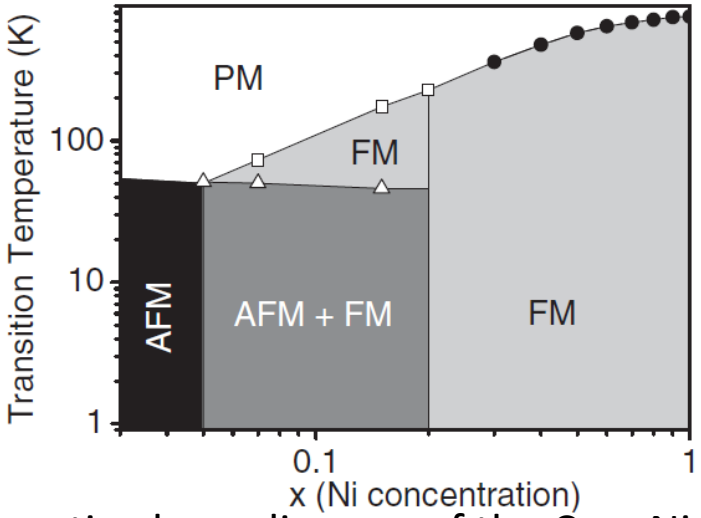




phys. stat. sol. (a) **9**, 97 (1972)



Temperature dependence of the magnetization of various $Ni_{1-x}Fe_xMnSb$ samples.



Magnetic phase diagram of the $Cu_{1-x}Ni_xMnSb$ Heusler alloys series from x = 0.03 to 1.

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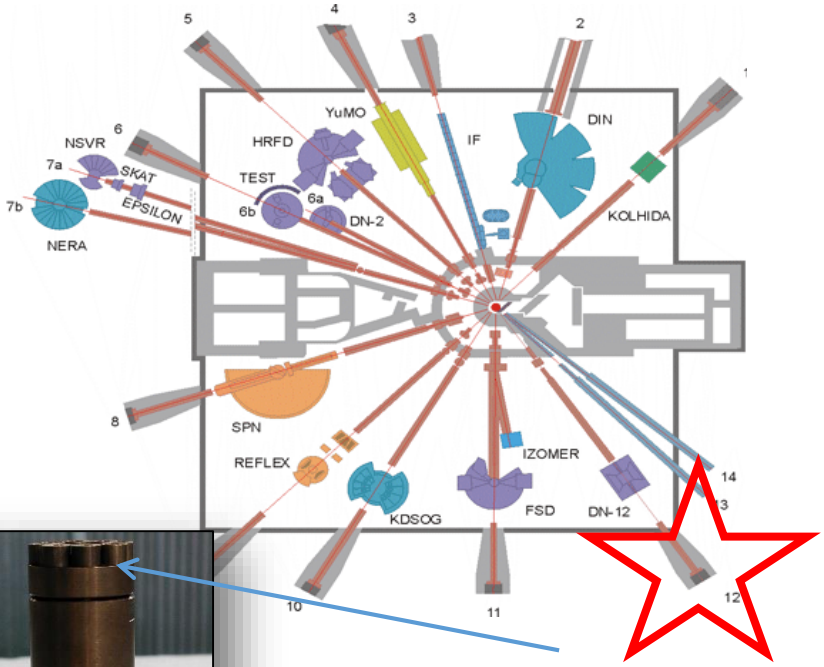
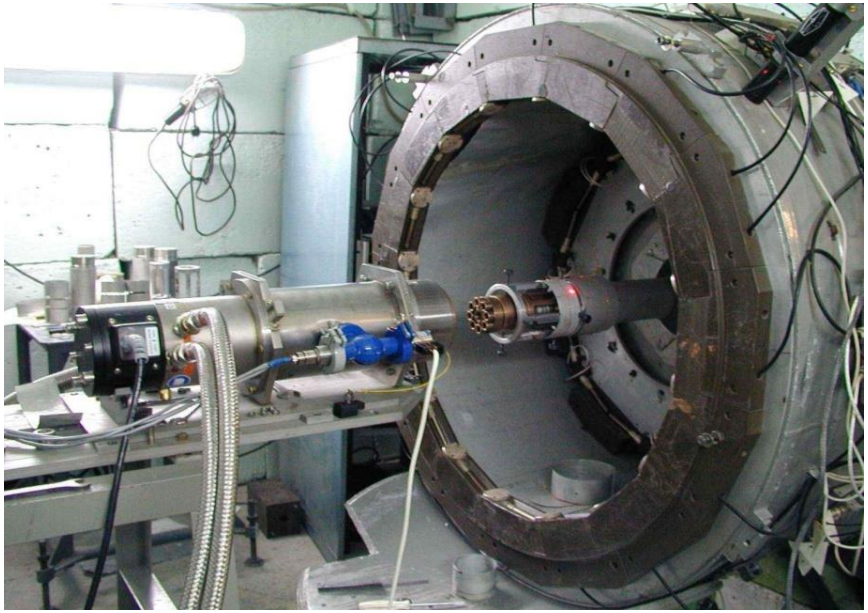
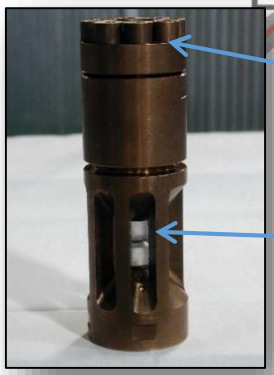
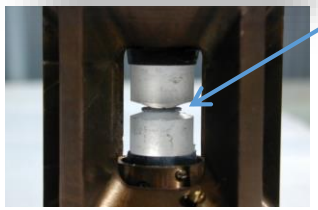
Neutron diffraction techniques under extreme conditions







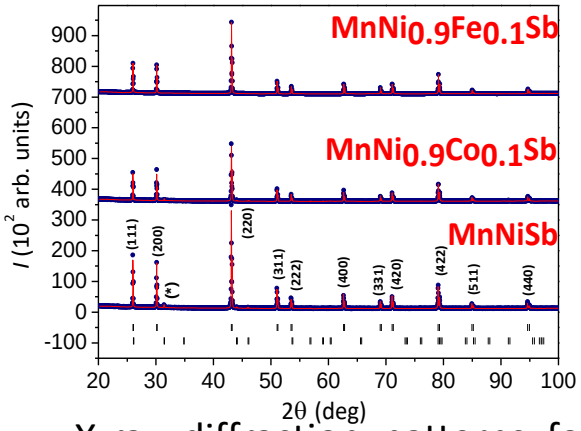


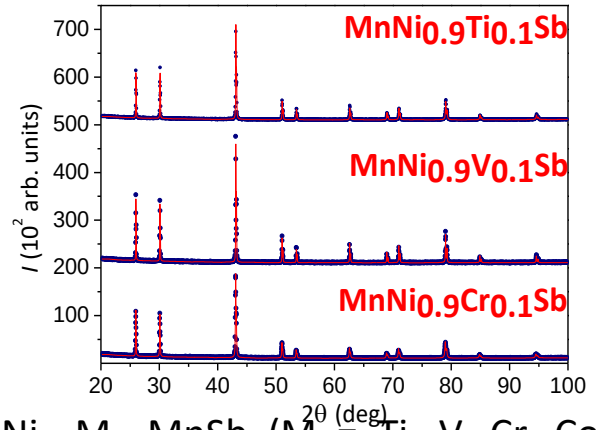
loading items
sapphire anvils
sample

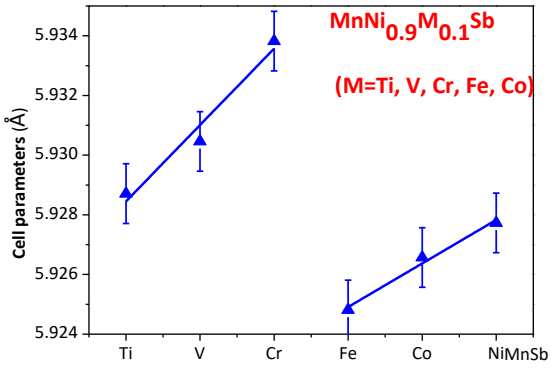
1. The thermal neutron flux on the sample at the nominal reactor power of 2 MW	$2.6 \cdot 10^6$ n/cm^2/sc
2. Wavelength Range	0.5 – 10 Å
4. Sample volume	0.2 – 5 mm^3
5. Typical time of spectrum measurement	4 – 30 h.
6. Temperature Range	10 – 320 K

Half-Heusler compounds under ambient conditions.

Crystal structure under normal conditions

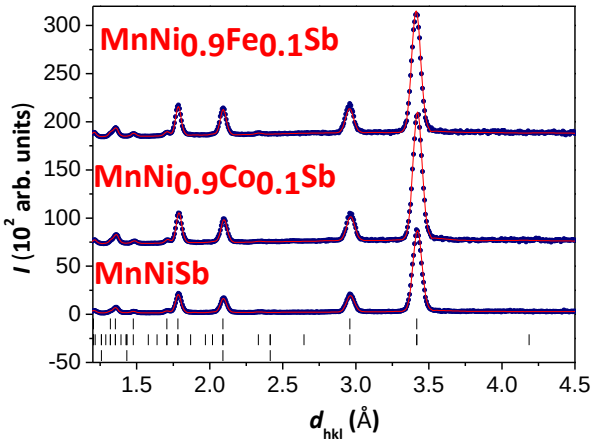


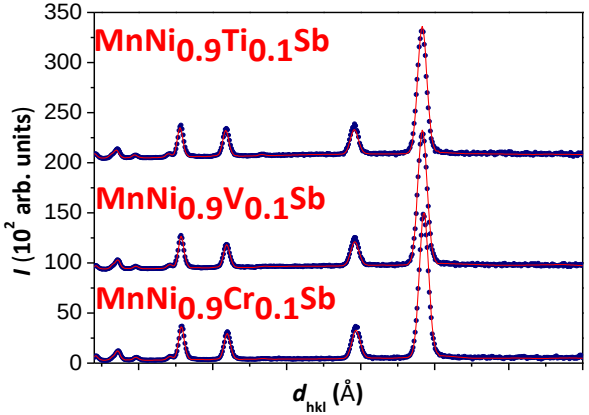


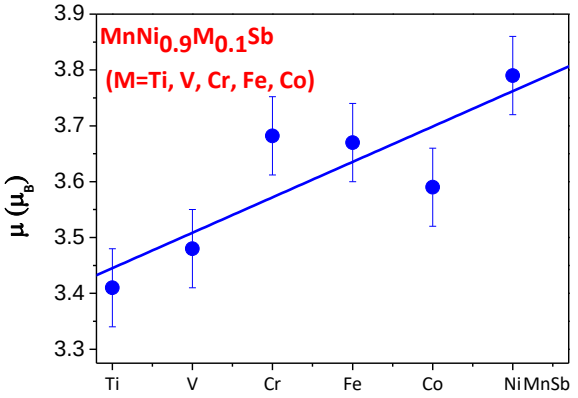


X-ray diffraction patterns for $Ni_{0.9}M_{0.1}MnSb$ (M = Ti, V, Cr, Co, Fe) samples and their unit cell parameters obtained under ambient conditions.

Magnetic structure under normal conditions

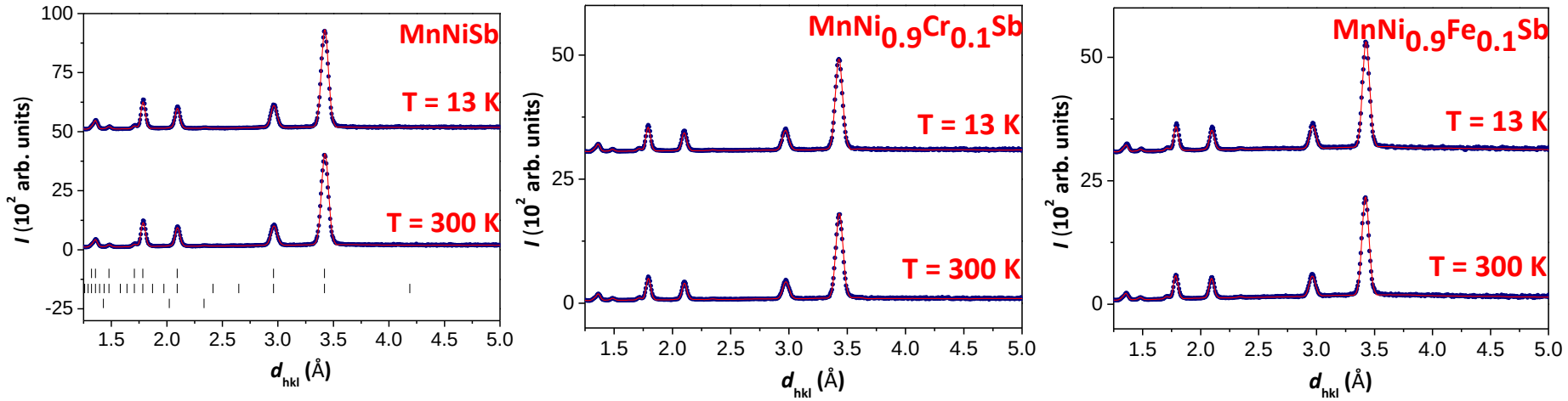




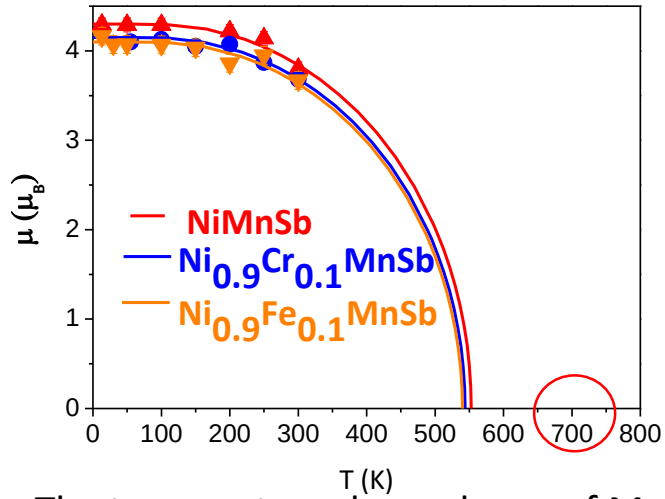


The neutron diffraction patterns for $Ni_{0.9}M_{0.1}MnSb$ (M = Ti, V, Cr, Co, Fe) and their composition dependences of the Mn magnetic moments for the obtained under ambient conditions.

Half-Heusler compounds under low temperatures



The neutron diffraction patterns for $Ni_{0.9}M_{0.1}MnSb$ (M = Ti, V, Cr, Co, Fe) at low and 300 K temperatures.



The temperature dependence of Mn magnetic moments for NiMnSb, $Ni_{0.9}Cr_{0.1}MnSb$ and $Ni_{0.9}Fe_{0.1}MnSb$ compounds.

Future studies:

1. To study $Ni_{0.9}M_{0.1}MnSb$ (M = Ti, V, Cr) at low temperature by means of neutron diffraction method;

2. To study $Ni_{0.9}M_{0.1}MnSb$ (M = Ti, V, Cr, Fe, Co) at high temperature up to 800 by means of neutron diffraction method;

3. To study NiMnSb and $Ni_{0.9}M_{0.1}MnSb$ (M = Ti, V, Cr, Fe, Co) under high pressure up to 8 GPa and at room temperature by means of neutron diffraction method.

Thank you for your attention!