Magnetism of $Th(FeAl)_{12}$ alloys

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9.7 cm

We have studied the magnetic ordering of $ThFe_xAl_{12-x}$ powder samples with iron concentration $x = 4$, 4.5 and 5 by means of x-ray and neutron diffraction techniques as well as spectroscopy with the monochromatic circularly polarized Mssbauer source (MCPMS) and magnetization measurements. Aforementioned thorium compounds crystallize in bct ($I4/mmm$) type structure. The magnetization measurements of $ThFe_xAl_{12-x}$ family disclose the methamagnetic states. The appropriate magnetic phase transitions against increasing iron content are close to: 160, 200 and 220 K, properly. The Mssbauer investigations reveal no ferromagnetism in $ThFe_4Al_8$ sample and distinct ferromagnetic character of $ThFe_{4.5}Al_{7.5}$ composition. Neutron diffraction shows the long - range magnetic order in the case of $ThFe_4Al_8$ only. The consistent description of the low temperature magnetic scattering requires the propagation wave vector in form: $\overrightarrow{q} = (0.267(5), 0.267(5), 0)$. The magnetic moment per iron atom is $1.5(3)\mu_B$ at 1.5K.

13.4 cm

Subject category :

4. Rare Earths and Actinides, Alloys and Compounds

Presentation mode :
poster

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