New Tetragonal Phase in Al-Fe-U System

Louisa Meshi, Lubov Burlaka, Michael Talianker. *Department of Materials Engineering, Ben-Gurion University, Beer-Sheva, Israel.* E-mail: louisa@bgumail.bgu.ac.il

Ternary aluminides in the Al-rich region of U-Fe-Al system have received considerable attention due to their interesting magnetic properties. Most of the structural studies of these materials were concentrated on UFe_xAl_{12-x} ($4 \le x \le 6$) compounds of $ThMn_{12}$ type described by the *I4/mmm* space group [1]. Recently it was reported about another type of a ternary intermetallic phase with a composition UFe_2Al_{10} that could be formed in the U-Fe-Al system. Its structure was determined as orthorhombic, belonging to the space group *Cmcm* [2]. In the present work we report our results on structural characterization of a new ternary aluminide observed in Al-rich corner of U-Fe-Al system. Its approximate composition is Al-4.2at%Fe-8.5at%U suggesting the provisional stoichiometry of U_2FeAl_{20}.

Using transmission electron microscopy and electron microdiffraction technique [3] the structure of the new phase was established as tetragonal with the unit cell parameters a=12.41Å and c=10.30Å. The space group describing the structure is $I\,\bar{4}2m$. The atomic model of the structure was developed using direct methods applied to the data taken from X-ray powder diffraction. The reliability factors characterizing the Rietveld refinement are: Rp=12.9%, Rwp= 15.5%, Rbragg=7.07% and Rf=3.7%.

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