EFFECT OF TITANIUM ADDITIONS TO LaB_6- ZrB_2 SYSTEM ON PHASE INTERFACE ENERGY

Filipov V.
Frantsevich Institute for Problems of Materials Science, NAS of Ukraine,
03142 Kiev, Krzhyzhanovsky st. 3, e-mail: filipov54@gmail.com

Lanthanum hexaboride is a widely used thermoemissive material. In our earlier investigations of LaB_6-$(Ti_x,Zr_{1-x})B_2$ system it has been established that the volume content of diboride in the eutectic, are strongly dependant on as well as the regularity of fiber distribution, Ti/Zr ratio [1]. Investigations of these alloys by means of HRTEM enabled us to study the evolution of fiber cross-section shape in detail. Also, the complete absence of mutual solubility between MeB_6 and MeB_2 has been confirmed (Fig.1) [2].

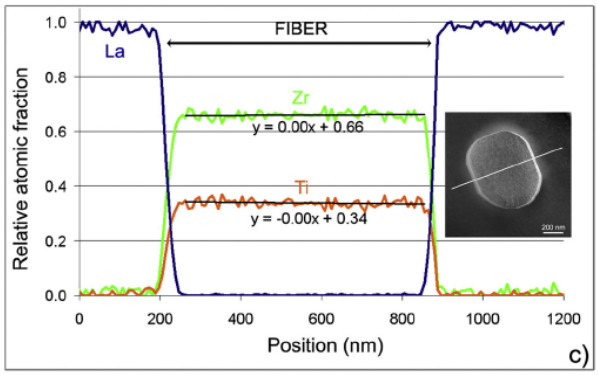

Fig. 1 Element distribution inside the matrix phase and inside a fiber of the LaB_6-$(Ti_{0,32},Zr_{0,68})B_2$ composition (alloy)

Formation of flat areas on the cross-section of the reinforcing fibers and mutual reversal of matrix phase and fiber lattices after partial of zirconium atoms for titanium ones in the diboride substitution of [2] provide reasons to suppose some changes in phase interface energy.

The latter was confirmed during the study of titanium additions on fracture toughness (Fig. 2) [3].

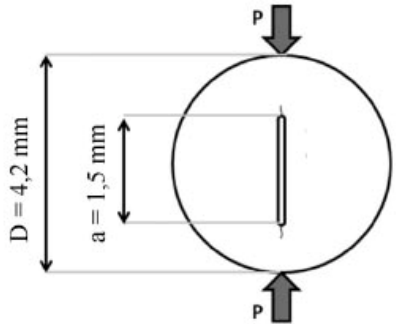

Fig. 2 Loading scheme and sample parameters for fracture toughness measurements

Accordingly, it is possible to conclude that the interaction on the matrix phase – fiber interface in LaB_6-$(Ti_x,Zr_{1-x})B_2$ system both during crystallization and during the material fracture is strongly dependant on the presence and quantity of titanium atoms in this system.

1. Paderno Yu. A new class of ‘in-situ’ fiber reinforced boride composite ceramic materials. In: Haddad YM, editor. Advanced multilayered and fiber-reinforced composites. The Netherlands: Kluwer Academic Publishers; 1998. p. 353–69.
2. Effect of Zr substitution by Ti on growth direction and interface structure of LaB_6–$Ti_xZr_{1-x}B_2$ directionally solidified eutectics, I. Jouanny, M. Sennour, M.H. Berger at all, Journal of European Ceramic Society, 2014 v.34, ish 11, p. 2101-2109.
3. Halyna Volkova, Vladimir Filipov, Yurij Podrezov, The influence of Ti addition on fracture toughness and failure of directionally solidified LaB_6–ZrB_2 eutectic composite with monocrystalline matrix, Journal of European Ceramic Society, 2014 in print