# DETERMINATION OF THE THERMAL CHARACTERISTICS OF SINGLE CRYSTALLAB$_6$ AND COMPOSITES LAB$_6$ -TIB$_2$

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Reinforcement of brittle ceramic materials by brittle ceramic fibers present a viscous state and raise the value of strength boride systems $LaB_6$ – $Me^{IV}B_2$ to 1500 MPa, hardness – to 50-75 GPa, fracture toughness – to $K_{1S}$> 25 MPa $m^{1/2}$ [1]. As in nature, there are many systems on the basis of refractory compounds with non-interacting components, special interest is directed to elucidating the mechanism of strengthening reinforced boride materials, manufacture, structure and properties are explored to date the most complete [2-3].

The strength of the composite is determined by the force of adhesion of fibers from the matrix, which depends on the internal pressure that must occur in the phase components of the composite during its production due to differences in thermal and mechanical properties of the matrix and fiber.

So on the basis of published data on the anisotropy of the thermal expansion coefficient diboride [3] in the system $LaB_6$-$TiB_2$ assumed that the fiber matrix $TiB_2$ stretched in the longitudinal direction and in the radially direction compressed. Aim of this work was to determine whether the issue and in no way affects the stress- strain state of phase components in the thermal expansion of the composite. That is why in the measured coefficient of thermal expansion of single crystal $LaB_6$ and eutectic alloy of $LaB_6$-$TiB_2$, obtained by directional solidification from the melt.

It was established that the coefficient of thermal expansion of the composite slightly smaller than the coefficient of thermal expansion of the matrix phase of lanthanum hexaboride. As the temperature increases the difference between the values of thermal expansion coefficient and matrix composites in general grown. And when heated to a temperature of 1300 $^oC$ a sharp decrease coefficient of thermal expansion composite, which is one reason why a change of the stress-strain state of the fiber.

X-ray structure analysis studies showed that $LaB_6$ single crystal oriented in the direction [211], whereas the composite has a polycrystalline structure. To clarify the stress- strain state of the fibers at room temperature was measured by X-ray device on Ultima IV lattice period matrix and the fibers of the diboride before and after removing them from the matrix phase by chemical etching. Found that after removal of the matrix fiber grating period decreases and the matrix phase increases. The values of compression stresses arising in the matrix phase is 0,864 GPa. At about 1200-1300 $^0C$ magnitude of stresses in the components of phase approaches according to the calculated values to zero, and can be the cause of abnormal deviation coefficient of thermal expansion of the composite.

Thus, it is established that directed reinforced $LaB_6$-$TiB_2$ composites with a matrix phase of lanthanum hexaboride rod and regularly spaced discrete fibers with titanium diboride having a coefficient of thermal expansion less than a single crystal of lanthanum hexaboride, which may be caused by the stress-strain state of the matrix phase.

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