THE NEW TRIPLE COMPOUNDS IN THE Sb$_2$Se$_3$-Yb$_4$Sb$_3$ SYSTEM

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The triple compounds in complex physic-chemical systems are formed as result of interaction of binary compounds as well in consequence of regulating in the areas of solid solutions. It is widely known that in the systems Ln-B$_3^{3+}$-C$^{VI}$ the compounds of LnB$_{3+2}^3$C$_{4}^VI$ and LnB$_{3+2}^3$C$_{7}^VI$, and Ln$_3$B$_{3+4}^3$C$_{9}^VI$ type are generated (1). The compound of LnB$_{3+2}^3$C$_{4}^VI$ type is a chemical analogue of Yb$_3$S$_4$, where two trivalent atoms (Yb$_{2+}$Yb$_{3+}$$_2$S$_4$) of ytterbium are substituted by the atoms of other elements oxidizing degree of which is equal +3. However, in these triple systems the other triple compounds may be obtained too.

In the present work Sb$_2$Se$_3$-Yb$_4$Sb$_3$ system has been investigated by the methods of physic-chemical analysis: (DTA, RPhA, MSA).

By the results of study phase diagram of Sb$_2$Se$_3$-Yb$_4$Sb$_3$ system state has been constructed. Two new compounds: Yb$_8$Sb$_{12}$Se$_9$ congruently melting at 625°C and Yb$_8$Sb$_8$Se$_3$ compound incongruently melting, have been found in the system. Formation of this compound Yb$_8$Sb$_8$Se$_3$ takes place by peritectic reaction:

L + Yb$_4$Sb$_3$ ⇔ Yb$_8$Sb$_8$Se$_3$. Temperature of the peritectic reaction is 800°C and composition of peritectic point is of 66.6mol%Yb$_4$Sb$_3$. In the area of subsystem Sb$_2$Se$_3$-Yb$_8$Sb$_{12}$Se$_9$ these occurs eutectic at 520°C composition of which is 11mol.%Yb$_4$Sb$_3$. Solid solutions on the base of Sb$_2$Se$_3$ are formed to 3mol.%Yb$_4$Sb$_3$ at eutectic temperature. Eutectic between two triple compounds has composition of 45mol.% Yb$_4$Sb$_3$ and temperature of 580°C. The results of RPhA and MSA also confirm formation of these two compounds, microhardness of which is 1450MPa for Yb$_8$Sb$_{12}$Se$_9$ and 2800MPa for Yb$_8$Sb$_8$Se$_3$, and density 6,37g/sm$^3$ for Yb$_8$Sb$_{12}$Se$_9$ and 7,92g/sm$^3$ for Yb$_8$Sb$_8$Se$_3$. The X-ray structural investigation of Yb$_8$Sb$_{12}$Se$_9$ monocrystal has shown, that they refer to rombic syngonia and have lattice period: a=13,14Å ; b=15,004Å ; c=42,43 Å, z=3/ .

Reference