PROCEEDINGS OF THE YEREVAN STATE UNIVERSITY

Chemistry and Biology 2013, № 2, p. 15–17

Chemistry

PHYSICAL-CHEMICAL RESEARCHES OF SYSTEMS, CONTAINING COMPLEX FLUORIDES OF RUBIDIUM, ALUMINIUM AND TERBIUM

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Melting system has been studied by thermographical, crystal optical and *X*-ray means. It has been proved that one chemical conjuncture is formed in that system $3Rb_3TbF_6$–Rb_3AlF_6 which melts without decay and 2 primary solid solutions α, β.

***Keywords*:** melting system, thermographical method, crystal optical method, hexafluorideterbiate, hexafluoridealuminate, aluminium.

Introduction. The current research is a continuation of the articles that we have previously conducted regarding the study of systems that contain complex fluorides of rubidium, aluminium and terbium [1, 2].

Recently in literature there has been no information regarding systems that are composed of hexafluorideterbiate and hexafluoridealuminate of alkali metal. We were the first to research the Rb_3TbF_6–Rb_3AlF_6 system.

The hexafluorideterbiate and hexafluoridealuminate of rubidium were prepared from chemically pure fluorides of terbium, aluminium and rubidium through dissolution of equivalent quantity of TbF_3, AlF_3 and RbF at 800–820^0C.

The fusion was carried out in platinum ware in atmosphere of argon by method from [1].

The compound of synthesized bindings was controlled by thermographic and chemical methods of analysis. The combinations of received alloys practically weren't different from the rated ones (Tab. 1).

Diagram of meltability was built on the ground of temperature effects, which respond to the phase transformations that occur during cooling of different by contents melts. The thermographs were received on "MOM" self-recording derivatograph [3]. For constructing the diagram of Rb_3TbF_6–Rb_3AlF_6 system's meltability detailed research was carried out of 24 samples, different compounds from 100 *mol* % Rb_3TbF_6 up to 100% *mol* % Rb_3AlF_6. Some of the samples were subjected to crystal-optic and *X*-ray–phase methods of analysis (Tab. 2, Fig.1).

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Table 1

Data of chemical analysis

Elements	Rated compound of masses, %	Content of masses, %
Tb	61.7	62.0
Rb	17.2	17.1
F	21.1	21.0
Rb	49.3	50.0
Al	26.4	26.5
F	24.3	24.1

Table 2

Results of crystal-optic researches

Contents of Rb_3TbF_6 in sample, *mol* %	Description of microstructure
100	The sample consists of flaky, lamellar granules and aggregate accumulation. $N_{av} = 1.430$
90	There are observed crystals of α phase: flaky and dendritic granules
75	There are visualizing $3Rb_3TbF_6$, Rb_3AlF_6 crystals, which are composed of tabularish and roundish glassy isotropic formations
30	The sample consists of two phases: solid solution and chemical compound $3Rb_3TbF_6$, Rb_3AlF_6, $N_{av} = 1.441$
5	There are observed crystals of phase: small lamellar isotropic crystals $N_{av} = 1.452$
0	There are visualizing isotropic crystals of irregular form compound Rb_3AlF_6, $N_{av} = 1.490$

The line-bar *X*-ray pattern of chemical compound doesn't contain lines of initial components – fluorides of terbium and fluorides of rubidium.

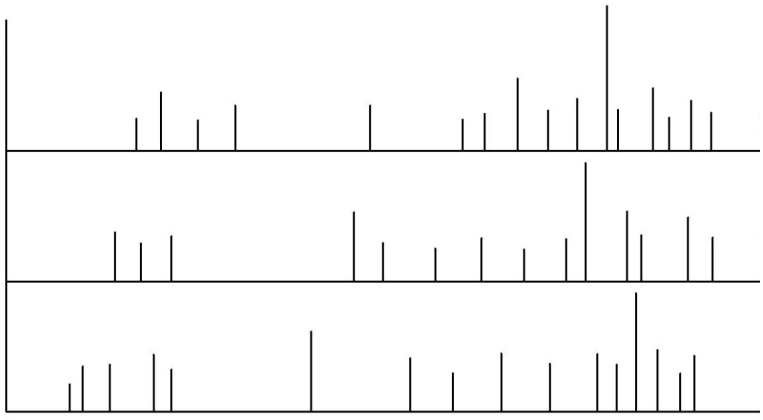

Fig. 1. The line-bar *X*-ray pattern of the sample in the $Rb_3TbF_6 \cdot Rb_3AlF_6$: a – Rb_3AlF_6; b – $3Rb_3TbF_6 \cdot Rb_3AlF_6$; c – Rb_3TbF_6.

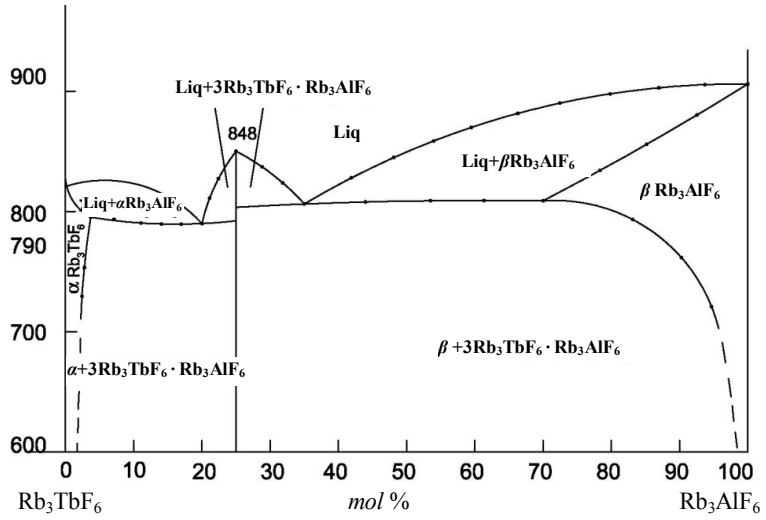

Fig. 2. Diagram of meltability of Rb_3TbF_6–Rb_3AlF_6 system.

Data, received at thermographic, radiographic and crystal-optic researches, are in perfect matching between each other and in their basis there is constructed diagram of meltability of Rb_3TbF_6–Rb_3AlF_6 system (Fig. 2).

From diagram we can see that the addition of insignificant amount of hexafluoridealuminate of rubidium to hexafluorideterbiate of rubidium and vice-versa leads to the formation of new phase-solid solutions α и β.

At the content of 75 *mol* % Rb_3TbF_6 the new chemical compound $3Rb_3TbF_6{\cdot}Rb3_3AlF_6$ gets formed, which melts congruously at the temperature of 848^0C, at 80 *mol* % – Rb3Tb F6·Rb_3AlF6 and 780^0C the collateral crystallization of solid solution and $3Rb_3TbF_6{\cdot}Rb_3AlF_6$ occur.

The second eutectic is formed at the content of 65 *mol* % Rb_3TbF_6 and 795^0C, where collaterally crystallize $3Rb_3TbF_6{\cdot}Rb_3AlF_6$ and β solid solution. On the diagram of meltability there are seven fields of crystallization of new-formed phases.

Hence, the researched system contains one congruous melting chemical compound $3Rb_3TbF_6{\cdot}Rb_3AlF_6$ and primary solid solutions α and β.

Received 12.05.2013

REFERENCES

1. **Babayan H.G., Mkrtchyan R.T.** Physical-chemical Studies of Systems Containing Complex Fluorides of Rubidium, Cesium, Anthanum and Praseodymium. // Arm. Chem. J., 1992, v. 18, p. 112 (in Russian).
2. **Babayan H.G., Mkrtchian R.T., Ter-Arakelian K.A., Gambarian S.G.** A physical-chemical investigation of systems, including complex fluoride of rubidium, cesium and lanthanum. III. Melting diagram of Rb_3AlF_6–Cs_3LaF_6. // Uchenie zapiski EGU, 1973, № 1, p. 130–133 (in Russian).
3. **Paulik F., Paulik I., Erdei Z.** Derivative Researches. // An. Chem., 1989, v. 4, p. 160 (in Russian).