3. *Oller I., et al. // Sci. Total. Environ., 2011.– Vol.409.– №20.– P.4141–4166.*
4. *ГН 2.1.5.1315-03 "Maximum permissible concentration (MPC) of chemical substances in water".*

HIGH-TEMPERATURE SYNTHESIS ACTIVATORS FOR REFRACTORY SILICATE COMPOUNDS

A.I. Cherepanova
Scientific Supervisor – DsC, Professor T.A. Habas
Linguistic Advisor – Associate Professor L.V. Maletina

National Research Tomsk Polytechnic University
634050, Russia, Tomsk, 30 Lenin ave., Ai_cherepanova@mail.ru

Cordierite-containing ceramics are widely used in science and technology because of a distinctive feature, its low coefficient of thermal expansion, which causes high heat resistance. Cordierite synthetic problems ($Mg_2Al_4Si_5O_{18}$) are constantly paid much attention. The effectiveness of cordierite synthes depends on many factors, including the properties of raw materials and the introduction of adjuvants. The aim of this work was to study the influence of the raw material mixture composition and blank forming method on the efficiency of the cordierite phase synthesis [1].

The raw materials for the cordierite synthesis were the chromite ore enrichment waste (the main mineral – serpentine), clay, alumina and bauxite. Aluminum nanopowder was added to one of the mixtures as an aluminum-containing raw material and a sintering activator. Unlike conventional powder aluminum nanopowder gives highly active alumina while heated in air and promotes an immediate reaction to form more complex compounds, in this case cordierite, without forming melt drops. Batches composition (B1, B2, B4) was calculated based on 100% yield of cordierite phase. Samples were prepared by semi-dry and moist plastic mass (30% water) molding and then sintered in air to a temperature of 1200 °C and held at the final temperature for 2h.

The X-ray analysis was applied to study the composition structure after firing.

The cordierite phase formation in the sample B4 with the addition of active alumina nanopowder had almost the same efficiency using any type of forming. In other samples, the intensity of reflections of cordierite in ceramic, obtained by plastic molding, resulting in increased contact area of the reacting species, is higher. The biggest difference was observed in sample B3 (twice higher intensity), containing as the compensator the missing part of bauxite Al_2O_3.

Significant growth of cordierite phase was detected applying the temperature range from 1200 to 1250 °C. The amount difference of cordierite phase obtained by sintering at 1250 °C and 1300 °C, is significant only for mixture B4. The cordierite phase growth applying this temperature range was 23%. The best results for cordierite phase formation at 1250 °C were achieved using a mixture serpentine-clay-bauxite (B2).

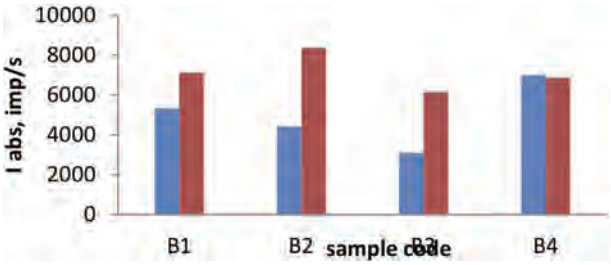

Fig. 1. *Comparative analysis of the cordierite phase formation at various kinds of molding $T_{sint.} = 1200$ °C*

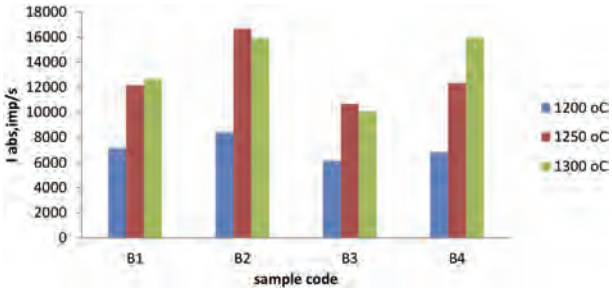

Fig. 2. *Effect of heat treatment on the cordierite phase formation in plastic molding blanks*

References

1. *Khabas T.A. Nanoporoshki metallov v tehnologii keramiki: uchebnoe posobie / T.A. Khabas; Tomskii politehnicheskii universitet.-2-e izd.– Tomsk: Izd-vo Tomskogo politehnicheskogo universiteta, 2009.– P.230.*

HEXA (ISOTHIOCYANATO) CHROMATE (III) PENTAHYDRATES OF SOME YTTRIUM GROUP LANTHANIDE AQUACOMPLEXES

E.V. Cherkasova
Scientific supervisor – DSc, Professor, T.G. Cherkasova
Linguistic advisor – PhD, Associate Professor, P.A. Strelnikov

T.F.Gorbachev Kuzbass State Technical University
650000, Russia, Kemerovo, st. Vesennyaya, 28, ctg.htnv@kuzstu.ru

Currently the studies related to the production of the functional materials for various purposes from the compounds – precursors [1–5] are actively conducted. We were first to obtained the ionic dual complex compounds $[Ln(H_2O)_8][Cr(NCS)_6]\cdot 5H_2O$, Ln=Er (1), Lu (2) by the direct synthesis and to study it by the of infrared spectroscopy and X-ray spectral analysis methods.

The crystals 1 and 2 are isostructural and crystallize in the triclinic system, space group $P\bar{1}$, Z=2, for 1: a=9.0677(4), b=9.3115(4), c=16.9595 Å, α=81.526(2), β=86.153(2), γ=83.879(2)°, V=1406.33(10) Å^3, $\rho_{выч.}$=1.894 g/cm^3; for 2: a=9.0438(3), b=9.2880(3), c=16.9181(3) Å, α=81.7250(10), β=861600(10), γ=83.8850(10)°, V=1396.38(7)Å^3, $\rho_{выч.}$=1,926 g/cm^3. Coordinated and hydrated water molecules are involved in the formation of intermolecular hydrogen bonds that bind the dual complex compound fragments in the three-dimensional system. It is found that the substances have reversible thermochromic properties, changing color upon heating-cooling.

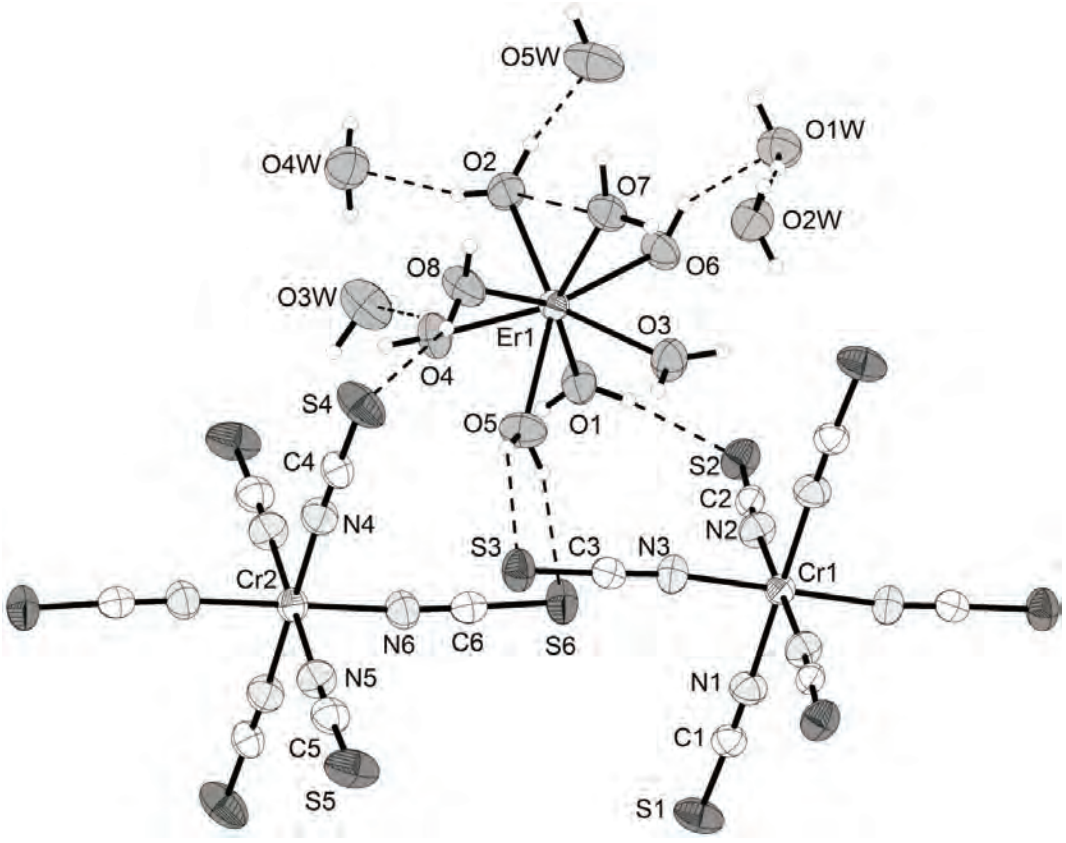

Fig. 1. *Numbering scheme of atoms in compound 1*