Nanocomposites and nanomaterials

Radiotransparent ceramic in the system $SrO - Al_2O_3 - SiO_2$

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As a result of theoretical studies for all composition of the simplex plan (fig. 1), the possibility of obtaining a strontium anorthite radiotransparent ceramic in a temperature range 700÷1700 K was determined. Obtained data indicates that the reaction of $SrO \cdot Al_2O_3 \cdot 2SiO_2$ synthesis more likely flows without a formation of intermediate compounds (Sr_2SiO_4 and $SrSiO_3$). Raw material compositions № 3 and № 7 has a minimum value of free Gibbs energy. However, these compositions contain a large amount of Al_2O_3, and after $SrO \cdot Al_2O_3 \cdot 2SiO_2$ synthesis part of the alumina oxides remains unbound. Such excess of Al_2O_3 leads to increasing of sintering temperature and decreasing of electro-physical properties.

Realization of the experiment allowed to determine the most technological area of the compositions for the obtaining of radio transparent ceramic that provides maximum level of sintering (0,17÷0,20 %) and mechanical strength (105÷175 MPa) and also low values of dielectric permittivity (5,15÷6,09) at sintering temperature 1350 °C. The optimum ratio of raw materials is : quartz : strontium carbonate: alumina = 50 : 25 : 25.

Thus, as a result of theoretical and experimental researches the compositions area for radio transparent ceramic was optimized and the best composition with the water absorption – 0,17 %, dielectric permittivity value – 5,15 and mechanical strength – 175 MPa was chosen.

The results will be useful for creation and improvement of operational characteristics and durability of new polyfunctional radiotransparent materials.