

Session	Poster Presentation
Date	APRIL 10, 2025
Time (CET)	17:20 - 18:20



High-Performance Glass Ceramics, Synthesized Based on Basalt of Uzbekistan

Zebo Babakhanova¹, Vladimir Kim¹, Normamat Normamatov²

¹Tashkent Institute of Chemical Technology, Uzbekistan

²Djizzakh Polytechnical Institute, Uzbekistan

Biography

Professor of the Department of silicate materials, noble and rare metals.

Abstract

Basalt rocks of the Karakiya deposit (Jizzakh region, Uzbekistan) were investigated to obtain of glass ceramics for architecture purposes. X-ray analysis showed that the crystalline phases of basalt are represented by calcite, anorthite, augite, chlorite, small amounts of magnetite and albite. To obtain acid- and heat-resistant materials, the batch composition was calculated to obtain of anorthite phase.

As a raw materials basalt of Karakiya deposit, primary enriched kaolin of Angren deposit and alumina containing waste of Shurtan gas chemical complex were chosen (all materials from Uzbekistan). Glass batch was melted in an electric furnace at a temperature of 1450° C. Glass crystallization was carried out in a laboratory muffle furnace. The glass samples were heat-treated at different temperatures - from 700 to 1000° C (temperature rise at a rate of 40° C/min) with holding at the final temperature for 3 h.

Glass-crystalline samples of black and dark violet-black colors were obtained. As a result of the studies, the optimal temperature of two-stage crystallization for the formation of a finely dispersed structure of anorthite glass ceramics was chosen as 800°C (1 h.) and 1000° C (1 h.). The properties of glass-crystalline materials significantly exceed the properties of glass materials: density increased from 2700 to 3100 kg/m³; compressive strength from 250 MPa to 670 MPa; chemical resistance to 35 % NaOH from 95 to 99.8; to concentrated HCl – from 99 to 99.9 %; to concentrated H₂SO₄- from 99.1 to 99.9 %. Calculation of composition of glass in accordance with laws of isomorphism made it possible to synthesize glass-ceramic with crystalline phase of a solid solution with an anorthite structure.

