

The Synthesis of Section of Glass Containing Barium Oxide

Yusupov Mirjalil Yunusovich

Department of inorganic substances
Tashkent Institute of Chemical
Technology
Urgench, Uzbekistan
e-mail: bzkm@mail.ru

Babaev Zabibullo Kamilovich

dept. Chemical Engineering
Urgench State University
Urgench, Uzbekistan
e-mail: bzkm1966@rambler.ru

**Matchanov Sherzad
Kamilovich**

dept. Chemical Engineering
Urgench State University
Urgench, Uzbekistan
e-mail: mbsh76@mail.ru

Radjabov Mansur Farhodovich

dept. Chemical Engineering
Urgench State University
Urgench, Uzbekistan
e-mail: r-misha38@rambler.ru

Buranova Dinara Bahtiyarovna

dept. Chemical Engineering
Urgench State University
Urgench, Uzbekistan
e-mail: dinora-8787@mail.ru

**Xadjiyev Azamat
Shamuratovich**

dept. Chemical Engineering
Urgench State University
Urgench, Uzbekistan
e-mail: axadjiev@mail.ru

Abstract—The article presents research on the production of barium-zirconium glass, applying the local mineral resource. Installed the possibility of obtaining high quality- grade glass with optimum content of BaO-7% and ZrO-2,5%.

Keywords—glass, synthesis, oxide - bari, content.

INTRODUCTION

One of the major challenges facing modern glass production is to improve the quality of products, the lack of raw materials due to poor equipment of existing mining and processing enterprises for extraction and processing of minerals, depletion of natural conditioned raw materials, raw material bases remoteness from consumers, etc.

Developing compositions and methods for preparing glasses of high light transmission in the visible part of the spectrum with a higher refractive index and high degree of dispersion is important.

Such glasses include lead crystal glass containing PbO 24% (hereinafter, the mass%). However, the production of these glasses is associated with a number of difficulties: on the one hand, lead oxide belongs to the first class of danger for the environment, which creates significant environmental problems, on the other hand recent years has multiplied the cost of raw materials lead.

In connection with the foregoing and other factors, considerable attention is paid to the development of high-quality lead-free glass compositions that are similar in their properties to the crystal. In particular, a high barium compounds, titanium-zirconium-containing glass and other compounds unleaded crystal [1-11].

Analysis of the developed compositions shows that they contain in their composition or oxides of rare

Our studies were designed barium compounds and zirconium based glass systems (SiO₂ - ZrO₂ - BaO - CaO - K₂O - Na₂O BaO content of from 5 to 10%) ZrO₂ - from 4 to 8% SiO₂ - 63 to 66%. Amount Na₂O,

earth elements other inaccessible and expensive components. In [11], the authors conducted a systematic study of the properties of glasses on the basis of SiO₂ - ZrO₂ - ZnO - CaO - Na₂O - K₂O content of ZrO₂ with from 1.0 to 15.0%, among which the most good cooking properties possessed glass with a maximum of ZrO₂ and 8%. It is known that glasses containing zirconium are "short" in the molding. The authors therefore recommended the development of a composition for mechanized excavation.

MATERIAL and METHOD

According to A.A. Appena among oxides increase the refractive indices, translucent, interest oxides having high values of the partial numbers for the index of refraction and dispersion in silicate systems [12]. These include

$$\text{PbO } (\bar{n}_D = 2,15 - 2,35);$$

$$\text{ZrO}_2 (\bar{n}_D = 2,20);$$

$$\text{TiO}_2 (\bar{n}_D = 2,00 - 2,25);$$

$$\text{BaO } (\bar{n}_D = 1,88).$$

Titanium oxide strongly "shortens" the glass forming art, reduces the tendency translucency due to the formation of complexes iron titanium coloring even with a low content of iron oxides.

Therefore, the greatest interest is the study of barium-zirconium glass, because with a positive effect of BaO and ZrO₂ on the optical characteristics, BaO, ZrO₂, unlike high temperature reduces viscosity, increases the resistance to crystallization and translucent.

K₂O and CaO is 20-25%. As raw materials were taken marching enriched quartz sand deposits Yangiarik, soda ash Kungrad soda plant, potash,

calcium oxide, and others. Chemically pure components of the brand

Melting experienced glass compositions performed in an electric muffle furnace heaters silit maximum temperature 14500S delayed for 1 hour. All glass compositions are well boiled, brightens and have high transparency. Molten glass was poured into a metal sheet was cooled in air. According gradient glass crystallization in the temperature range 550 - 10000S for 60 minutes in crystallization of the bulk characteristics of glasses is not detected.

By known methods of research [13] synthesized glasses measured density, water resistance, TFLE, light transmission and calculated by determining the values of the refractive index n_d and the total variance Δn . Ranges of variation in the properties of the glasses are given in the table.

Properties of the synthesized glasses

| № | The name of indicators | value indicators | |
|---|---|-----------------------|---------------------------|
| | | Experienced component | Traditional component [3] |
| 1 | disposition to crystallization | None | None |
| 2 | density, кг/м^3 | 2680-2700 | 2700-2750 |
| 3 | Initial softening temperature, $^{\circ}\text{C}$ | 570/625 | 550-650 |
| 4 | TFLE, $\cdot 10^{-7} \text{ K}^{-1}$ | 90,0-96,0 | 90,0-100,0 |
| 5 | Water resistance (in mass loss), mr/r | 0,35-0,65 | 0,3-0,7 |
| 6 | refractive index, | 1,530-1,565 | 1,515-1,560 |
| 7 | dispersion, $\Delta n \cdot 10^5$ | 930-960 | 920-980 |

Thus, on the basis of the laboratory tests established the possibilities of synthesis of high-quality high-grade products are not inferior in properties containing lead crystal glass. In this case, the optimal value of the content of BaO is considered to be 7.0% and ZrO₂-5%. As the main feedstock recommended enriched quartz sand Yangiarik field.

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