USE OF THE NEW DEPOSITS OF QUARTZ SANDS OF THE REPUBLIC OF BELARUS IN THE PRODUCTION OF SHEET GLASS

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In the production of sheet glass, great attention is paid to ensuring the required light transmission parameters. The spectral transmission parameters of glass depend on several factors, the most important of which is the quality of the raw materials. The problem of providing the glass industry of the Republic of Belarus with the high-quality raw materials is aggravated by the depletion of the reserves of the main quartz sand deposit in Lenino. The need to replenish the raw materials base of the glass factories and the intensive development of the glass production necessitate the development of new deposits of quartz sands. In the territory of the Republic of Belarus there are several known deposits of quartz sands that are suitable for glass-making. The largest ones are Lenindar and Gorodnoye deposits. According to the preliminary evaluation the quartz sands of these deposits are suitable for use in the glass industry.

The quartz sands of Gorodnoye deposit (the Western accumulation) in their native state (without enrichment) have the following chemical composition, wt. %: SiO_2 98.7–99.34; Fe_2O_3 0.05–0.15; Al_2O_3 0.20–0.52. The quartz sands of the Eastern accumulation of Gorodnoye deposit in SiO_2, Al_2O_3, Fe_2O_3 content meet the requirements fit a wide range of brands of glass (GOST 22551 «Quartz sand, ground sandstone, quartzite and veiny quartz for glass industry. Specifications»), however, sands suitable for the manufacture of reduced translucency products and dark green glass predominate prevail. Accordingly, such quartz sands can be used after preliminary enrichment.

Currently, Lenindar quartz sands deposit is in the exploitation of Gomel mining and processing complex. The South-Eastearn section of this deposit contains fine-grained glass sands with high clay content. After enrichment of these sands, sands content of Fe_2O_3 0.1–0.25 wt.% are obtained that are not used in the glass industry of the Republic of Belarus . Based on the quality of the sands, the North-Western section of Lenindar deposit is the most suitable for mining.

Now comprehensive study of the technological properties of quartz sands of the new deposits and effective methods of their enrichment is very topical. Modern requirements to the quality of quartz sands to be used for sheet glass melting are higher than the ones established in GOST 22551. For example, for floating method production of the sheet glass for producing double-glazed, low-emission coating glass, multilayer glass, type's sand for highly important high-transparency products, important high-transparency products and high-transparency products is used. According to chemical composition of quartz sand the content of silicon oxide and the impurity components - iron and aluminum oxides - is limited as well as the content of Cr_2O_3 (not more than 0.00015 wt. %), TiO_2 (not more than 0.05 wt.%), V_2O_5 (not more than 0.001 wt.%).

The development of technology for conditioning quartz sands from the new deposits was based on the modern requirements to technological process of sheet glass production. At the same time, economic factors of enrichment technology were taken into consideration in accordance with the recommendations. The methodology of research of technological properties of the quartz sands comprises a comprehensive study of the influence of their chemical and granulometric composition on the processes of silicate and glass formation during sheet glass melting in a gas fired glass melting furnace. Variation of temperature-time mode for glass synthesis within the temperature range of 1100–1500 °C makes it possible to estimate the speed of glass melting processes during the use of such research methods as optical and electronic microscopy, X-ray diffraction analysis and Raman spectroscopy. The quality of glass samples synthesized using quartz sands with various chemical and granulometric composition at the temperature of 1500±10 °C was assessed based on the homogeneity indicators (presence of crystal, gas and glass inclusions) and spectral transmission.