THE SUBSTANTIATION OF THE GLASS FIBRE TYPES CHOICE FOR THE BICOMPONENT HEAT-INSULATING REFRACTORY MATERIALS

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The search for ways to improve the efficiency and cost effectiveness of production processes and equipment requires developing and using thermal insulation that meets the following requirements: low thermal conductivity, stability at high temperatures in various environments, and availability of raw materials for production. One of the most effective thermal insulation materials is fibre refractory, which has several properties that distinguish it from traditional refractory materials: lower apparent density, low thermal conductivity, good elasticity and vibration resistance, very high thermal shock resistance, chemical resistance, low energy storage, which significantly reduces the weight of the lining, reduces fuel consumption and increases the efficiency of thermal units.

Thermal insulation materials made of glass fibres with an alumina-silicate composition are widely used; the main ones are basalt and mullite-silica fibres. In addition to excellent thermal insulation properties (one of the lowest thermal conductivity coefficients among inorganic fibre materials) and low weight, basalt fibres are highly resistant to high temperatures and chemically active environments. Basalt fibres are relatively cheap, non-flammable and fire resistant, but the maximum use temperature is limited to 900 – 1000 ºC. Refractory fibres of mullite-silica composition also have low bulk density, high chemical resistance, and low thermal conductivity, although higher than for basalt fibres. Their operating temperature is up to 1400 ºC, but the cost of mullite-silica fibres is quite high due to the use of expensive raw materials, among other factors.

Therefore, it is an urgent task to develop bi-component heat-insulating fibre refractory materials using basalt and mullite-silica glass fibres, which will allow the new materials to have a service temperature close to that of products made of mullite-silica fibres and a thermal conductivity at the level of products made of basalt fibres, and the cost of the new materials will be lower than that of products made of mullite-silica fibres. Research is planned to obtain heat-insulating products by moulding from hydromasses and layering two types of fibres with different proportions of basalt and mullite-silica fibres and binders. The main properties of the developed materials (bulk density, permanent changes in dimensions on heating, thermal conductivity) and their effective application will also be determined.