INCREASING CHEMICAL PURITY FUSED BY HIGH TEMPERATURE ANNEALING IN VACUUM

Grigorenko A.V., Belyaev G.E.,* Vlaskin M.S., Lipatova I.A., Zhuk A.Z.

JIHT RAS, Moscow, Russia
**belyaev_g@yahoo.com*

The aim of this work was to investigation of the white fused alumina refining process under high temperature in a vacuum. The annealing temperature was 2023 K (1750◦ C), the pressure in the vacuum chamber was not worse than $3 \times 10^{-}3$ Pa ($2 \times 10^{-}5$ Torr.)

Three types of industrial samples white fused alumina were investigated. Samples were extracted from the upper part of the 6-ton ingot – the so-called crust, as well as from its middle and bottom parts.

Before and after annealing, granulometric measurements were carried out for each sample by laser diffraction. Average size of samples granules before/after vacuum heat treatment [μm]: ingot crust – 16 / 25, middle part of ingot – 32 / 32, bottom part of ingot – 64 / 65 The chemical composition of the samples (60 elements) was studied by ICP M–S. As a result of heat treatment of samples in vacuum, the total amount of impurities in electro-corundum decreased by approximately an order of magnitude. After processing, the samples of electro-corundum were practically completely purified from impurities such as Na, Mg, K, Mn and Zn. The iron content in the samples was reduced by a factor of 8–10.

The purification process, vacuum refining of corundum consists of three main stages: i) impurity diffusion in the volume of particles to the surface; ii) evaporation of the impurity from the surface of the particle; iii) impurity diffusion along the pores of the particle.

It was shown the possibility of industrial white fused alumina powders purification by high temperature vacuum annealing. The presented results can be used to produce on industrial scale corundum abrasive and refractory materials of high purity.