**Appendix No. 2**

**to Contract No. \_\_\_\_ dated \_\_\_\_\_\_\_\_\_ 2018**

**Novosibirsk** **\_\_\_\_\_\_\_\_\_ 2018**

**Technical Requirements to the Quality of**

**AZS Fused Cast Refractory Materials**

1. **General**

Classification: alumina-zirconium-silica product, type AZS30 / 40 ISO 10081-4.

Main components of the raw material: alumina, zirconium dioxide, zirconium silicate, sodium carbonate.

Type of refractory: fused cast.

Main application: container glass, flat glass, special glass.

1. **Classification of AZS Fused Cast Refractory Materials**

AZS fused cast refractories are made with long-arc melting and oxidizing. They can be classified by ZrO2 content and casting methods as shown below:

a) AZS0317 (AZS 33):

РТ—regular casting (AZS0317PT);

ZWS—reinforced casting (AZS0317ZWS);

WS—void-free casting (AZS0317WS).

b) AZS0327 (AZS36):

РТ—regular casting (AZS0327);

ZWS—reinforced casting (AZS0327);

WS—void-free casting (AZS0327).

c) AZS0337(AZS41):

РТ—regular casting (AZS41PT);

ZWS—reinforced casting (AZS41ZWS);

WS—void-free casting (AZS41WS).

1. **Chemical and Physical Properties of AZS Fused Cast Refractories**
   1. Chemical Composition (determined on a calcined substance (1025 °C) according to EN ISO 12677)

Table 1. Target Values of the AZS Chemical Composition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Chemical composition, %** | | **AZS 33** | **AZS 36** | **AZS 41** |
| Al2O3 |  | Residual | Residual | Residual |
| ZrO2+HfO2 | ≥ | 32.5 | 35 | 40 |
| SiO2 | ≤ | 15.5 | 14 | 12.5 |
| Na2O + K2O | ≤ | 1.6 | 1.5 | 1.3 |
| Fe2O3+ TiO2+CaO+MgO+B2O3 | ≤ | 0.3 | 0.3 | 0.3 |

* 1. Bulk density of products

Table 2. Target Values of Bulk Density for AZS Products

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | | **AZS-33PT** | **AZS- 33ZWS** | **AZS- 33WS** | **AZS-36ZWS** | **AZS-36WS** | **AZS-41 ZWS** | **AZS-41 WS** |
| Bulk density\*, g/cm3. Determined by EN 993-1 | ≥ | 3.42 | 3.65 | 3.72 | 3.80 | 3.85 | 3.95 | 4.00 |

**\*** The bulk density standard applies to products of more than 50 kg.

* 1. Physical Properties and Performance Indicators

Table 3. Target Values of Physical and Mechanical Properties and Performance Indicators of AZS Products

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | | **Unit** | **AZS 33** | **AZS 36** | **AZS 41** |
| Corrosion resistance to molten glass in static state (soda-lime glass at 1500 °С х 36 h). Determined by TC11 | ≤ | mm/24 h | 1.6 | 1.5 | 1.3 |
| Mechanical strength in cold state, determined according to EN 993-5 | ≥ | MPa | 200 | 200 | 200 |
| Refractoriness under load 2·105 Pа. Determined according to ISO 1893 | ≥ | °C | 1700 | 1700 | 1700 |
| Foaming index at contact with glass liquid (soda-lime glass at 1550 °С). Determined by TC11 | ≤ | index | 2.0 | 1.5 | 2 |
| Vitreous phase exudation  (1500 °C x 4 h) | ≤ | % | 3 | 2 | 2 |
| Linear expansion (1000 °С) |  | % | by test | by test | by test |

* 1. Crystallographic Structure Analysis

Results of crystallographic structure analysis depend on the casting method and sampling points. The table shows typical values for AZS products.

Table 4. Typical Phase Composition of AZS Products

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **AZS 33** | **AZS 36** | **AZS 41** |
| Alumina (corundum) | 46.5% | 43.5% | 42% |
| Zirconia | 32% | 35.5% | 40% |
| Vitreous phase | ≤21% | ≤20% | ≤17% |

|  |  |
| --- | --- |
| Исполнитель:  Юридический Адрес:  Телефон:  e-mail:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ // /  . Заказчик:  ООО «Сибстекло»  Юридический адрес:  630047, г. Новосибирск, ул. Даргомыжского, 8а  ИНН 5406305355 КПП 540201001  ООО SIBSTEKLO  Телефон: (383) 363-37-70, факс: (383) 363-37-75  e-mail:  [ecran@ecran.ru](mailto:ecran@ecran.ru )  [www.ecran.ru](http://www.ecran.ru)  Генеральный директор АО «Завод «Экран» —  управляющей организации ООО «Сибирское стекло»  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ /А. С. Яковлев/ | Executor:  Legal address:  Phone number:  e-mail:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/ /  Customer:  OOO Sibsteklo  Legal address:  8a, Dargomyzhsky Str., Novosibirsk, 630047  INN 5406305355 / KPP 540201001  OOO SIBSTEKLO  Tel.: (383) 363-37-70, fax: (383) 363-37-75  e-mail: ecran@ecran.ru  www.ecran.ru  Director General of AO Zavod “Ekran”, - Management Company of OOO Sibsteklo  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ /A. S. Yakovlev/ |