When processed statically the specimens' strength is not taken into account in the damaged sections where defects are detected as laminations and large cavities (Fig. 3).

Deviations from the average stress values in bending and the variation coefficient do not stray from the ranges typical of test results for brittle materials of the corundum type obtained on geometrically accurate specimens with machined surfaces [1, 2, 5]. For control specimens taken from 11 industrial meltings of rolled electrocorundum of different compositions, the variation coefficients came within the range 4–23%.

Thus, the newly designed specimen satisfies the requirement for mechanical testing and can be recommended for measuring the strength of brittle materials with untreated surfaces.

LITERATURE CITED


CERAMIC PIGMENTS OF THE CORDIERITE TYPE
IN THE MgO – CoO – Al2O3 – SiO2 SYSTEM

L. I. Cherepanina, V. P. Pyrkov, L. A. Vizir, and A. N. Denisov

The synthesis of ceramic pigments requires the use of crystal lattices of natural minerals which are resistant to high temperatures and corrosive media [1]. Such lattices are possessed by spinels, garnets, zircons, mullite, cordierite, etc.

Pigments based on cordierite (2MgO · 2Al2O3 · 5SiO2) were synthesized in this study in which the MgO was replaced by CoO sequentially in equimolecular quantities. The physicochemical properties were determined together with the phase composition of the pigments; their suitability for use as ceramic colors was also studied.

The original materials consisted of MgO (GOST 4526-74), Al2O3 (GOST 6912-74), and SiO2 (GOST 9428-73). In order to study their effect on the color of the pigments the CoO was taken in the form of Co2O3 (GOST 8671-73), Co(NO3)2 · 6H2O (GOST 4528-68) and CoCl2 · 6H2O (GOST 4525-68). The wetted mixture of materials was carefully mixed and ground on a glass plate with a porcelain grinder, dried in air, and calcined in biscuit porcelain crucibles in gas production, and laboratory electric furnaces at the Dulevo Color Factory. The batch was fired in neutral atmospheres which is recommended for the synthesis of cordierite [2].

Boric oxide, B2O3 was used as the mineralizer in amounts of 2% of the calculated weight of pigment; it was added to the batch as boric acid, H3BO3. The batch was fired at the optimum temperature (1320°C). After firing the pigments consisted of powders. The mineralizer H3BO3 (Table 1) was added to all pigments except No. 1/5A.

As the CoO increased the color of the pigments altered from bluish (No. 1/2) through dark blue (No. 1/5) to light blue (No. 1/7). The difference in the color of pigments of the same compositions was noted only in regard to the presence or absence of H3BO3 in the batch. The boric-free pigment was darker.
Fig. 2. X-ray patterns of pigments. c) Cordierite; M) mullite; Cr) Cristobalite; Q) quartz; S) spinel; Cd) corundum.

TABLE 1

<table>
<thead>
<tr>
<th>Pigment No.</th>
<th>CoO moles</th>
<th>CrO3 %</th>
<th>MgO moles</th>
<th>Al2O3 %</th>
<th>SiO2 %</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1</td>
<td>1.95</td>
<td>13.32</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>S</td>
</tr>
<tr>
<td>1/2</td>
<td>1.95</td>
<td>13.32</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>S</td>
</tr>
<tr>
<td>1/3</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>S</td>
</tr>
<tr>
<td>1/4</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>S</td>
</tr>
<tr>
<td>1/5</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>S</td>
</tr>
<tr>
<td>1/5A</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>13.70</td>
<td>2.00</td>
<td>S</td>
</tr>
</tbody>
</table>

Color:
- White
- Bluish
- Blue
- Dark blue
- Light blue
- Blue with gray shades