When alumina rings, which are very abrasive, are being pressed, the ejection force in an ordinary mold was up to 40 tonne, and in the QIS mold—up to 10 tonne.

A study of the new design and a check of the working factors in industrial conditions led to the development of a high-output technology for QIS pressed products used in a number of factories. The saggers obtained are of high quality. Thus, the life of fireclay saggers is 5-7 times longer than for saggers made by static pressing. Figure 4 shows specimens of articles pressed in industrial molds.

Owing to its triaxial application of the pressure, QIS is at present the best method of shaping goods from powders, and compared with hydrostatic pressing it reduces considerably the amount of equipment in use; the production area is also reduced; the technical procedure is simplified and reduced, which in turn reduces the expenditure needed for setting up the process in experimental or production conditions.

The new method is a highly productive technological process suitable for complete modernization and automation.

LITERATURE CITED

PHOSPHOGYPSUM CERAMIC BODY WITH IMPROVED PHYSICOCHEMICAL PROPERTIES

M. T. Mukhamedzhanova, A. P. Irkakhodzhaeva, and N. A. Sirazhiddinov

In order to develop new ceramic bodies for consumer products we investigated phosphogypsum from the Almalyks Chemical Factory. This material is formed in the production of phosphoric acid by a method involving sulfuric-acid decomposition of phosphorite powder from the Karatau deposits.

Phosphogypsum consists of a finely dispersed, sand-like substance, dark gray in color. Grain-size analysis shows that the main fractions are 1.6-0.4 and 0.16-0.1 mm in size. The material contains 2-3% fractions <50 μ.

The density of phosphogypsum, dried in natural conditions, is 2340-2360 kg/m³, which approximates to natural dihydrated gypsum. The specific surface, determined by the air-permeation method, varies from 31 to 35 m²/kg.

It is established that phosphogypsum consists mainly of dihydrated gypsum with interplanar distances d = 0.750, 0.425, 0.304, 0.286, 0.267, and 0.189 nm. Quartz is also present.

Differential-thermal analysis showed that dehydration occurs at 100-180°C, and is accompanied by an endothermic effect. A small endothermic effect with a maximum at 540-550°C indicates the presence of quartz. At 670-780°C there is dissociation of the carbonates present in the raw material. The exothermic effect at 985-1100°C is connected with the appearance of dicalcium silicate due to the reaction of the calcium oxide and the quartz.

The material was used to make bodies on the basis of conventional raw materials whose chemical compositions are shown in Table 1.

The slips were deflocculated with 0.1% (here and subsequently mass contents are indicated) soda ash, and 0.3-0.35% water glass. The water content of the slip was 44-45%, and the milling fineness corresponded to a residue of 1-1.5% on mesh No. 0063.
Studies of the optimum compositions (Fig. 1 and Table 2) showed that they are readily deflocculated, have satisfactory casting properties, and sinter well in firing. Specimens obtained from these bodies were successfully tested with all production cycles.

Following laboratory testing, body No. 1 was chosen for production trials. At the Angrensk Ceramic Combine the body was prepared in a ballmill using the combined grinding method. The milling time for the first charge was 3.5-4 h, and for the second 2 h. The casting slip had a fineness of 1.5% (residue on mesh No. 0063), water content 44-45%, and fluidity 7-10 sec (viscometer diameter 6 mm).

The aged, plastic body was used to shape the ware - casseroles and dishes, which after drying on the shelving were fettled. Then they were given the first firing in a roller electric kiln at 750-800°C.

The biscuit ware was dipped in colored, production glazes with a density of 1.56-1.58 g/cm³.

The second firing was done in periodic kilns at 1220-1230°C in 54 h. The water absorption of the goods made of this body of optimum composition was 4.6-5.2%, which provided a high thermal-shock resistance and other satisfactory properties.

After firing the ware had a good surface finish, and corresponded in all respects to OST 2152-82.

Goods made from body No. 1 had an air shrinkage of 4.2-4.4%, total shrinkage 10.1-10.9%, water absorption 4.6-5.2%, coefficient of thermal expansion $5.66 \times 10^{-6} \text{°C}^{-1}$, and thermal shock resistance 200°C.