

## **Influence of surfactants on the deformation properties of ceramic mass**

Artykova D. M-K<sup>1</sup>, Musabekov K.B.<sup>1</sup>, Reinhard Miller<sup>2</sup>

- 1) Al-Farabi Kazakh National University, Almaty, Kazakhstan  
[Dana.Artykova@kaznu.kz](mailto:Dana.Artykova@kaznu.kz).
- 2) Max Planck Institute of Colloids and Interfaces, Potsdam, Germany,

Keywords: ceramic mass, surfactants, rheological properties

One of the most important uses of clay minerals is the production of a variety of building materials - building bricks, facing bricks and ceramic tiles - household items and art objects, etc., for which an important role is played by the formability of the ceramic materials [1]. Formability of the ceramic paste is determined by its structural and mechanical type, which can be defined by a detailed analysis of the structural and rheological characteristics. From the existing six structural and mechanical types with good formability only concentrated suspensions of the first type, and in addition of the second type with the property of allowing to make molds without leaving traces [2].

Many natural clay minerals are not capable of forming a paste relating to these types. Changing the structural mechanical type of clay suspensions may be accomplished by small additions of surfactants. Kaolinite clay from the Koskudyk deposit in Kazakhstan is used for the production of building bricks. However, molding of ceramic products and art trade objects from clay paste is empirical and without scientific basis.

In this regard, a structural and rheological analysis of concentrated clay suspensions and clarification of the influence of various parameters, such as concentration of surfactants, on the structural and mechanical type of suspension are urgent problems of colloidal chemistry and physico-chemical mechanics. And so the objective of the present study was to investigate the influence of surfactants such as cetylpyridinium bromide (CPB), sodium dodecyl sulphate (SDDS), ethoxylated-alkyl-phenol (OP-10).

According to the theory of Rebinder and his school high-quality ceramic materials should be characterized by certain criteria, such as by an elasticity  $\lambda < 0,5-0,6$ , a plasticity  $P \leq (6-8) \cdot 10^{-5} \text{ s}^{-1}$  and a relaxation period of  $\theta \geq 400-450 \text{ s}$ . Ceramic materials with high quality in the ternary diagram should be in the region of the first and particularly the second structural-mechanical type. A suspension is considered to be of highest quality when located near the middle or top of  $\gamma'_2$  ternary diagram.

The use of surfactants can change the process of structure formation in a suspension of kaolinite and also change its structural and mechanical properties by reducing the formation of micro-cracks during drying and by increasing the workability of the ceramic materials.

### References:

1. Phair, J.W. and A.F. Kaiser, Determination and Assessment of the Rheological Properties of Pastes for Screen Printing Ceramics. Annual transactions of the Nordic Rheology Society, 2009. Vol. 17.
2. Kara, A., H.Y. Kurama, Y. Kara and S.S. Kurama, 2013. Utilization of Coal Combustion Fly Ash in Terracotta Bodies. Key Engineering Materials, 264-268, 2513. Date Views 24.10.2013 scientific.net. 2513. 264-268.
3. Rebinder P.A. Physically-chemical mechanics – new field of the science, Moscow, Znaniye, 1958. – 207 p.