

# Low-Temperature Technology Dispersing Refractory and Raw Materials

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Main purpose of this research work is the development of simple, inexpensive and high-performance method dispersing refractory and raw materials to produce aqueous media for hardening ready-made parts, tools and to fabricate construction composite materials for industry, building and peaceful life.

The dispersion process can be explained within the Rebinder effect owing to wedging action of polar molecules of surface-active substances in a microcrack of any solids including refractory and raw materials. Dispersing materials is based on temperature gradient  $\Delta T$ , pressure gradient  $\Delta P$ , chemical concentrations gradient  $\Delta C$  and other gradients  $\Delta X_i$  which are created within materials and outside. The radius of dispersed particle  $r$  is mathematically dependent on the following param

$$r = f(\sigma_s \cdot \tau \cdot n / \Delta T \cdot \Delta P \cdot \Delta C \cdot \Delta X_i)$$

wherein  $\sigma_s$ - surface tension;  $n$  - number of cycles;  $\tau$ - duration of change of the gradient

As seen from the formula minimal radius of particle  $r$  is provided if:

$$\sigma_s, \tau \rightarrow \min; \Delta T, \Delta P, \Delta C, \Delta X_i \rightarrow \max; n \geq 1$$

For this purpose, an aqueous suspension of refractory and raw materials (silicon carbide, silicon oxide, chalk, sand, clay, etc.) are dispersed by special technology. Maximum process temperature does not exceed 350 °C and the minimum temperature - 0 °C. Varying the regimes (temperature, duration) on a specially developed device for dispersing materials and composition of aqueous suspension, we can reduce the particle size up to 30-500 nm.

The proposed dispersing method has the advantages over the known technologies:

- simplicity of the process because it can be implemented on a simple design equipment and does not require protective atmosphere
- energy efficiency since the process temperature does not exceed 350 °C
- high productivity because of the opportunity to make dispersing materials by using a chemical bath of an arbitrary size
- ecologically safe process
- low production cost of dispersing materials

The method can be used in industry, medicine and other fields of human life.

*Applications in industry* Dispersed silicon carbide and silicon oxide can be used to manufacture plastic and wear-resistant ceramics for end seals in oil and gas industry, heat-resistant ceramic engines and steam-gas turbines, resistant diamond-like ceramic tools and parts. Dispersed raw materials can be used for the building and road construction composite materials: dispersed sand - for concrete, plaster, pavement, and dispersed clay - for tile, brick, etc. Besides membranes for water and wastewater can be made of dispersed clay and sand. The 50-500 nm particle size can be used for these purposes.

*Medical applications* Dispersed chalk can be used for restoration of hair and tooth enamel, treatment of skin diseases and other cosmetic purposes. The 30-100 nm particle size can be used for these purposes.