

**STUDY OF THE KINETICS OF PHASE TRANSFORMATION
OF γ - Al_2O_3 NANOPARTICLES INTO CORUNDUM***Vinogradova V.O.*^(1,2), *Bugrov A.N.*^(1,2)⁽¹⁾ Saint Petersburg Electrotechnical University "LETI"
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Aluminum oxide is widely used as insulating and abrasive coatings, as well as a catalyst in oil refining processes. Al_2O_3 -based ceramics are used to manufacture dental implants and hip replacements. The addition of Al_2O_3 nanoparticles to polymer matrices improves their mechanical and thermal properties. Aluminum oxide has many modifications, of which the most stable is the α - Al_2O_3 (corundum) phase. This material is chemically and thermally stable, possessing high strength and permittivity. In this study, the kinetics of nanocrystalline corundum formation under high-temperature annealing conditions was investigated.

The annealing precursor was obtained using the sol-gel method. A sample of $\text{Al}(\text{NO}_3)_3$ along with 2-3 drops of acetic acid was added to a 0.5 M solution of stearic acid in dimethylformamide at 70 °C with continuous stirring. The resulting mixture was then homogenized isothermally until the precursors were completely dissolved, yielding a clear solution. Gradually raising the temperature above 100 °C caused the melt to change color to bright red and boil, releasing nitrogen oxide (IV). After the solvent evaporated, a pale-yellow aluminum stearate gel was obtained. In the first series of samples, aluminum stearate was annealed for 2 hours at temperatures of 900 °C, 1000 °C, and 1100 °C. In the second and third samples, the annealing time was varied from 2 to 12 hours (in 2-hour increments) at 900 °C and 1000 °C, respectively.

As a result, three series of Al_2O_3 samples were obtained, the phase composition of which was studied using X-ray diffraction. The formation of the corundum phase exclusively was observed during annealing for 2 hours at 1100 °C (the first series of samples). With a decrease in the annealing temperature, the appearance of the α - Al_2O_3 phase was observed with a longer holding time (the second and third series of samples). The average crystallite size for the separately obtained γ - Al_2O_3 phase was 4 ± 1 nm, and for corundum, 44 ± 4 nm.