

Nanocomposites and nanomaterials

APPLYING A SOL-GEL METHOD FOR THE SYNTHESIS OF DOUBLE SILICATE APATITE STRUCTURE

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Silicate with the apatite structure currently used in many fields of science and technology as a source of luminescent materials, catalysts, solid electrolytes, therefore growing interest in the improvement of methods of synthesis of these compounds [1,2].

Methods for producing double silicates with the apatite structure are known for a long time. One of the first was a solid-phase (high temperature) synthesis method. This method had several drawbacks. The main drawback is the high temperature of sintered samples. Temperature could reach up to 1900°C, which in turn is not suited for the synthesis of alkali silicate elements with the apatite structure. To date, there are several alternative methods for the synthesis of double silicate: method of coprecipitation, sol-gel and hydrothermal. The main of which can be called a sol-gel method [3,4].

Sol-gel method was used to obtain double silicates of sodium and neodymium $\text{Na}_x\text{Nd}_{(10-x)}(\text{SiO}_4)_6\text{O}_{(3-x)}$, ($x = 0,5; 0,8; 1,3; 1,5; 1,7; 2; 2,3; 2,5; 2,7; 3.$) with the apatite structure. Sodium and neodymium silicates studied by X-ray diffraction (XRD) and scanning electron microscopy (SEM).

Synthesis was carried out at 1050°C as a maximal temperature. Selected temperature conditions prevented the sublimation of sodium oxide. This made it possible to obtain compounds of correct elemental composition.

XRD results confirmed that the structure of apatite begins form at a baking temperature of 800°C and maintains its structure up to 1050°C. According electron microscopy for a series of samples with neodymium, elements almost uniformly distributed over the surface of the particles, which indicates a homogeneous sample.

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