

## **Nanocomposite and nanomaterials**

### **Features of F-modification of tetragonal zirconia: impact on nanoparticles characteristics**

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F-modification of tetragonal zirconia is one of the methods of adaptation of bioinert material to the living tissues or to surface of polymeric matrix, in particular, dental fillings, polymeric or ceramic implants or artificial limbs. However, at F-modification of tetragonal zirconia, the questions of competitive effects of influence of cationic and F (anionic) dopants on materials and characteristics of nanoparticles are created. The main aim of our work was to explain the influence of type of F-agent on characteristics of material and nanoparticles, for instant phase stability, nanoparticles shape and on process of nanoparticle forming.

For syntheses of F-modified zirconia was choose the multistage scheme the F-modification of amorphous zirconia – the dehydration and crystallization of F-modified amorphous zirconia – and forming of oxide nanoparticles (NPs). For F-modification of amorphous zirconia the 2 type of F-agents – simple  $\text{NH}_4\text{F}$  and complex  $\text{NH}_4\text{F}:\text{NH}_4\text{FHF}$  was used. The exchange of terminal OH groups of amorphous zirconia on F-ions was investigated by FTIR and ESR spectroscopy. It was shown, the type and concentration of F-agent influence on structure, phase composition and NPs shape. The using of  $\text{NH}_4\text{F}$  for modification in dependence on concentration and modification time allows varying shape of NPs from isometric to needle or tape-shaped. Transfer from  $\text{NH}_4\text{F}$  to complex F-agent ( $\text{NH}_4\text{F}:\text{NH}_4\text{FHF}$ ) enables to obtain the oxyfluoride zirconia. The kinetics and mechanism of basic syntheses stage are investigated.

Thus, amorphous zirconia may be used as sorbent for F-ions from water. The utilization of such used sorbent gives a useful product – NPs with change shape, the latest is good material for creation of porous ceramic with grains of needle-shape. Such ceramic may be used for membranes or filter with porous size near 200-300 nm.