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THE EFFECT OF ANNEALING IN AIR ON THE PHYSICOCHEMICAL PROPERTIES OF CEF3 NANOPARTICLES PRODUCED BY PULSED ELECTRON EVAPORATION

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The present work continues to investigate the physicochemical characteristics of cerium fluoride nanopowder (NP) produced (Fig.1) using the method of pulsed electron beam evaporation in vacuum [1]. The resulting NP was isothermally annealed in air at the temperature of 200, 300 and 500 ° C for 30 minutes. Further, the properties of annealed NPs were evaluated using XRD, HRTEM, DSC-TG, photo and cathodoluminescence, magnetic measurements on Faraday scales. The degree of cytotoxicity of not annealed NP CeF_3 to cell cultures was determined. XRD showed that the cubic phase CeO_2 formed in NP CeF_3 after annealing at the temperature of 500 ° C. Cathodoluminescence was not excited, both in the initial NP and in annealed NP. The intensity of photoluminescence of NP CeF_3 decreased non-monotonically with an increase in the annealing temperature, the appearance of the oxide phase CeO_2 led to an increase in the intensity of photoluminescence.

The paramagnetic response of the NP decreased after annealing at the temperature of 500 °. The addition of not annealed NP CeF_3 to tumor culture HeLa and non-neoplastic Vero culture resulted in a 20-35% reduction in cell viability at all NP concentrations in the aqueous suspension (0.1, 05, 1.0 mg/ml). The obtained data show the low cytotoxicity of NP CeF_3 to tumor and non-tumor cells. Annealing of the NP CeF_3 at low temperatures (200 and 300 ° C) led to an improvement in the textural parameters of the not annealed NP, almost tripling the size and volume of the pores, with a slight decrease in the specific surface area of the NP, from 62 m^2/g in the not annealed NP to 44.5 m^2/g after annealing at 300 ° C. Improved texture parameters indicate the prospect of using CeF_3 as a nanocontainer to deliver various dosage forms in biomedicine.

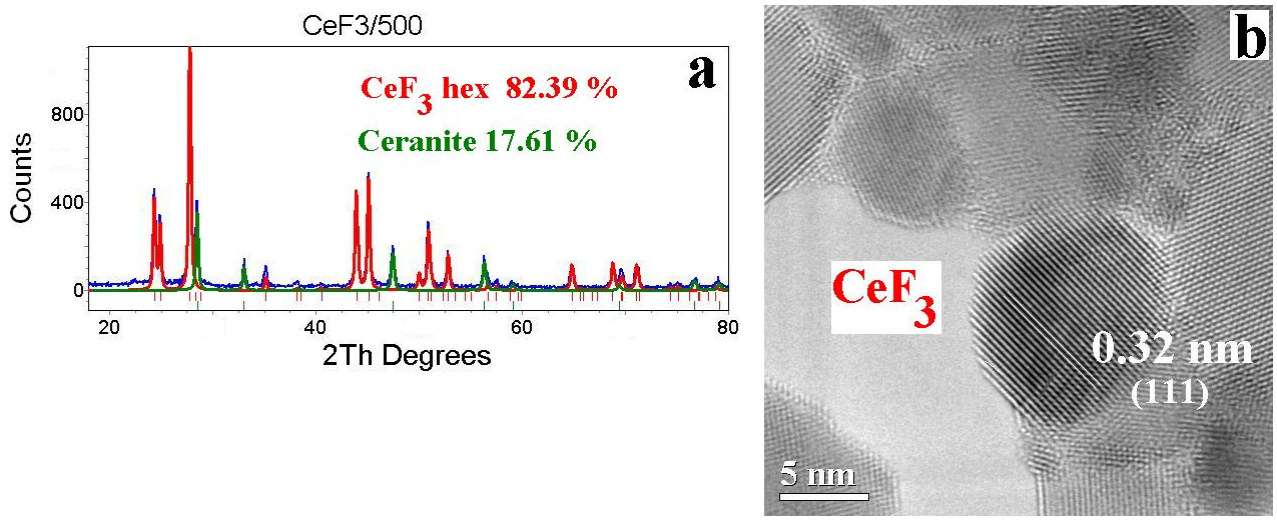

Fig.1. (a) XRD pattern NP CeF_3 annealed in air at the temperature 500 °C, (b) HRTEME image initial CeF_3 NP .

REFERENCES

[1] V. G. Ilves, S. Yu Sokovnin, M. A. Uimin, "Properties of cerium (III) fluoride nanopowder obtained by pulsed electron beam evaporation" J. Fluor. Chem., vol. 253, no. , pp. 109921(7), January 2022.