Features of the Sol–Gel Process of Formation of Nanostructured Gadolinium Oxide

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Abstract—The process of dehydration of $Gd(OH)_3 \cdot nH_2O$ obtained by the sol–gel method from a solution of $Gd(NO_3)_3$, to Gd_2O_3 in the temperature range of 50–700°C was explored. The hydrogel and Gd_2O_3 structurization is shown to depend on the additives (AF-12 and 2-propanol). The final average particle size of Gd_2O_3 after annealing at 700°C is 20±2 nm, depending on the conditions of the synthesis. The resulting oxide particles are larger than the particles of yttrium oxide Y_2O_3 (17±2) obtained under the same conditions of the process due to the higher basicity of gadolinium and its higher coordination number with respect to the OH groups. This promotes the formation of crystalline phases of $Gd(OH)_3$ at lower temperature, 50–250°C, while maintaining a favorable structural short-range order in passing through an amorphous state to a crystalline Gd_2O_3.

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