The spherical micropowders as the precursors for RE^{3+}-doped silica gel-glass preparation

A.A. Boiko, E.N. Poddenezhny*, V.A. Boiko*, I.M. Melnichenko*, L.V. Sudnik**

Gomel State Technical University, 48 October Av., 246746 Gomel, Belarus, E-mail: alexeenko@gsu.unibel.by
**Gomel State University, 104 Sovietskaya St., 246699 Gomel, Belarus*
***Reserch Institute of Powder Metallurgy, 41, Platonova St., 220600 Minsk, Belarus*

The synthesis of spherical micropowders doped with rare-earth elements (RE) ions promising for industrial preparation of optical silica glasses.

The process of doped silica powders preparation incorporates the hydrolysis of tetraethylorthosilicate in the system $Si(C_2H_5O)_4$-H_2O-NH_4F-$(CH_2)_6N_4$, introduction the sel of RE^{3+} ($MCl_3 \cdot 6H_2O$) into the sol, gelation in the period of 30 min, drying and presintering at 600^0C in 8 hours. The incorporation of fluorine into the reaction mixture catalyses the hydrolysis process and reduces buble formation up on consolidation at high temperature.

The using of hexamethylenetetramine in the process of silica spheres preparation results in the formation of supramolecular complex $LnCl_3 \cdot [(CH_2)N_4] \cdot 12H_2O$ in the intermiceleous space under thermo-treatment.

For preparation of porous green bodies the method of cold pressing and slurry molding were utilized. The diameter of spherical particuls was 0,5–1,5 μ with narrow size distribution. The following thermo-treatment of RE^{3+}-containing porous materials at the temperature 1200–1350^0C on air lead to formation of porous silica glass. The using of hydrogen-oxygen flame is required for consolidation the green bodies into clear doped gel-glass.

The mechanism of doping via process of complex formation is considered as well as the models of RE^{3+}-ions behavior in silica network.

The optical and luminescent properties of gel-glasses doped with Er^{3+} ions as well as REM investigations is considered in the paper.