

Luminescent Light Filters Based on Ce-, Sm- and Ce-Sm- Doped Silica Gel Glasses for Laser Heads

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A purpose of this work is presentation of Ce-, Sm- and Ce-Sm-doped silica glasses obtained by sol-gel method as a selective light filters for lamp pumped neodymium lasers. It is shown a possibility of enhancement of Ce concentration $N_{\text{Ce}}=3 \times 10^{20}$ ions/cm³ without significant aggregation of optical characteristics. It has been found that with increasing Ce concentration there takes a place an essential decrease of absorption cross sections of Ce(III) and Ce(IV) oxygen complexes and an appearance of visible absorption which is related with the Ce clusters. The intensity of such absorption decreases with reduction of Ce(IV) share. It was observed that for removal of transparency window at 250 nm in absorption spectrum of these glasses at preservation of high luminescence efficiency the ratio of Ce(III) to Ce(IV) concentrations should be in the range of 5 - 10. As a result we have prepared the Ce glasses with the absorption index $k > 50 \text{ cm}^{-1}$ at $\lambda < 350 \text{ nm}$ and the quantum yield of luminescence $> 50\%$.

The Sm doped glasses are characterized by stronger light scattering (the index of light scattering is up 3 cm^{-1} and more at $\lambda = 600 \text{ nm}$). The Sm doped glasses are dominated by Sm(III) oxygen complexes. We did not observed the presence of the Sm(II) forms. The Sm codoped Ce glasses are characterized by an enhancement of UV absorption and an appearance of broad band luminescence at 430 nm.