

Influence of preparation redox conditions and composition of Ce-containing silica gel-glass on its absorption spectrum in visible region

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A nature of absorption of Ce-containing glasses in visible region of spectrum is discussed till now. In the present paper, we researched the influence of preparation redox conditions and composition of Ce-containing silica glasses obtained by the direct sol-gel method on the absorption. For the glasses, such absorption is displayed by a broad band with a maximum at $\lambda \sim 500$ nm. It is established that the preparation of the glasses in strong oxidative conditions (impregnation of monolithic xerogel with a highly-concentrated solution of CeO_2 in mixture of $\text{H}_2\text{O}:\text{HNO}_3:\text{HCl}$ and prolonged vitrification of the xerogel in oxygen to a state of transparent glass) leads to the highest peak intensity ($k \sim 10 \text{ cm}^{-1}$) of the broad band. Annealing of the glasses in hydrogen results in attenuation of the band down to its complete disappearance. A co-doping the Ce-containing glasses with Al, La, Nd, Sm, Er, Tm and Yb, is accompanied with attenuation and displacement of the band. Annealing of the glasses in air leads to more complicated 'spectroscopic behavior' of the band. Obtained results refute opinion [1] that the absorption band at $\lambda \sim 500$ nm for similar glasses is stipulated by formation of the clusters representing the complex groupings of $\text{Ce}^{4+}\text{-O-Ce}^{3+}$.

Reference

1. G.S. Bogdanova, B.F. Dzhurinskii, S.L. Antonova, *Izv. Akad. Nauk SSSR, Ser. Neorg. Mater.* VI, 776 (1970).