The layer-by-layer study of spectral and luminiscent propeties of nanostructures in silicate slide glass

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Silicate glass are widely used in optics. They can be activated by various ions including silver. The introduction of a large concentration of silver in silicate glass is possible by ion exchange (IE) method. Broadband luminescence is an important feature of silver clusters in glass luminescence. A layer-by-layer studies of silver nanostructures after ion exchange haven't been carried out previously. The aim of this work was to investigate spectral and luminescent properties of silver nanostructures in the ion exchange layer of silicate slide glass depending on the stratified surface layer.

Silicate microscope slide glasses were used in this work. Silver clusters were synthesized in glass by IE method at 450 °C for 15-90 min. At each step, absorption spectra of sample were measured. Also, luminescence spectra of sample were measured at an excitation wavelength of 340 nm.

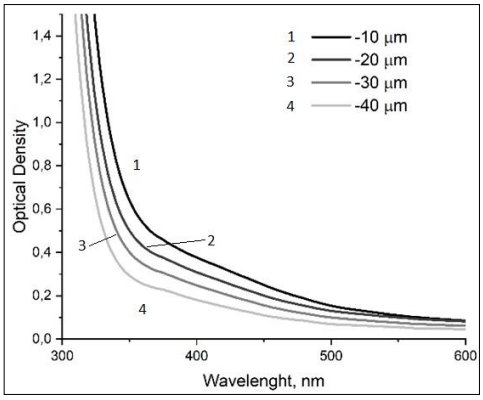

Figure 1. the optical density depending on the stratified surface layer

It was shows that the depth of the silver layer increases from 35 to 55 μm with increasing IE duration time. In each glass, the absorption spectra confirmed the presence of silver nanoparticles with a maximum of about 417 nm. Besides, glass luminesces thankfully to the presence of silver clusters. The luminescence maximum of clusters shifts from 593 to 613 nm because of the presence of different silver clusters set. After chemical etching, the absorption maximum of silver nanoparticles decreases. But a band of remaining silver clusters is revealed. (fig. 1) The silver clusters intensity increases under UV irradiation with the increasing of the thickness of etching layer. It may be related to decreasing of concentration of silver nanoparticles. [1].

References

[1] L. Yu. Mironov, D. V. Marasanov, Y. M. Sgibnev, Sannikova, E. V. Kulpina, I. E. Kolesnikov. J Lumin, (2023) 119918.

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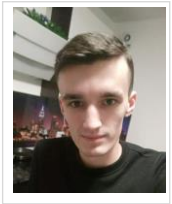

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