THE IMPACT OF EXPOSURE TIME ON THE OPTICAL PARAMETERS OF **SILVER NANOSTRUCTURES**

Bulavinets Tetiana¹, Yaremchuk Iryna¹, Iluin Oleksandr¹, Bobitski Yaroslav^{1, 2}

¹ Department of Photonics, Lviv Polytechnic National University 12, S. Bandera Str., Lviv 79013, Ukraine Email: tetiana.o.bulavinets@lpnu.ua

This work is devoted to the study of the influence of synthesis conditions, in particular, the wavelength and exposure time on the concentration and the absorption peaks position of the obtained nanostructures.

Synthesis of spherical silver nanoparticles in aqueous solution was performed by photostimulated reduction. A study of the effect of laser irradiation time of the silver colloid on the optical response and concentration of nanoparticles in solution was performed. It was shown that long-term irradiation of silver colloid by LEDs with wavelength of 465, 525 and 633 nm leads to changes in the morphology and, consequently, the optical response of silver nanostructures in an aqueous solution.

² College of natural sciences, Institute of Physics, University of Rzeszow Rzeszow, Poland.

The impact of exposure time on the concentration and absorption peaks position of Ag-NPs

of Ag-NPs,

mg / ml

0.17

0.31

0.44

0.69

0.92

1.18



Fig. 1. Change in the colloid absorption during the synthesis of Ag-NPs by photoreduction. Ag-NPs concentration and the absorption peaks intensity increases with increasing of synthesis time.



Fig.2. The dependence of Ag colloid absorption on the irradiation time by LED with a wavelength of 465 nm

Fig.3. The dependence of Ag colloid absorption on the irradiation time by LED with a wavelength of 623 nm



Change in color of silver colloids with irradiation time from the initial yellow on day zero to 7.5 days (from left to right)

CONCLUSIONS

The synthesis of Ag colloid was carried out by photoreduction method. It is shown that obtained Ag NPs are characterized by absorption peak at a wavelength of 405 nm and a yellow colloid color, which is typical for spherical silver nanoparticles.



Fig.4. The dependence of Ag colloid absorption on the irradiation time by LED with a wavelength of 525 nm

- It is shown that increasing of exposure time leads to an increase in the NPs concentration and peak absorption intensity.
- The influence of the exposure time of colloidal silver by LEDs with wavelength of 465, 525 and 633 nm on their optical response has been investigated. It was found that exposure wavelength affects the absorption peak position and size of formed NPs. Thus, an absorption peak of about 900 nm was obtained under irradiation with red light and of 570 nm under the green one. Irradiation of Ag colloid with blue LEDs leads to the appearance of an additional absorption shoulder of about 500 nm.

ACKNOWLEDGEMENTS

The authors would like to acknowledge financial support of Ministry of Education and Science of Ukraine, grants DB/Interface and DB/MEV.