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Investigating the effect of exposure time on laser writing and its removal on silver-silver chloride photochromic layer

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Abstract

In this research, the effect of exposure time on the phenomenon of multicolor photochromism in silver-silver chloride thin film has been investigated. The effect of multicolor photochromism in the silver-silver chloride layer is created by continuous-beam laser radiation in a short time. Irradiating the subwavelength silver-silver chloride layer by monochromatic and linear polarized laser beam in the visible light region, creates multicolor photochromism phenomenon and induced anisotropy simultaneously. Anisotropy in these layers is due to the alignment of silver nanoparticles along the polarization of light; whereas multicolor photochromism due to the resizing of silver nanoparticles is proportional to the wavelength of the incident light. An interesting phenomenon in silver-silver chloride thin films is the possibility of removing both effects by ultraviolet radiation. Also, in this study, we showed that although the phenomenon of multicolor photochromism is caused by laser writing in a short time, the complete removal of this effect by irradiation of ultraviolet light is not instantaneous and is done over time. Therefore, the use of silver-silver chloride thin films is not only useful for multiple color printing, it also has the potential to be used for dosimetry of ultraviolet light.

Keywords: silver-silver chloride, ultraviolet radiation, surface plasmon resonance, photochromism, absorption spectrum

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