*Thematic Section:* Research into New Technologies. **Full Paper**
*Subsection:* IR Spectroscopy. *Reference Object Identifier* – ROI: jbc-02/16-48-12-109
Publication is available for discussion in the framework of the on-line Internet conference "*Butlerov readings*".
http://butlerov.com/readings/
Submitted on January 5, 2016.

# Selective enlightenment of AgBr-TlI and AgBr-$TlBr_{0.46}I_{0.54}$ solid solution crystals

© **Alexandr E. Lvov**, **Alexandr S. Korsakov**,
**Dmitry D. Salimgareev**, and **Liya V. Zhukova***[+]
*Ural Federal University named after the first President of Russia B.N. Yeltsin. Mira St., 19. Yekaterinburg, 620002. Russia. Phone: +7 (343) 375-47-13. E-mail: l.v.zhukova@urfu.ru*

*Supervising author; [+]Corresponding author

***Keywords:*** silver halides, monovalent thallium halides, enlightenment, spectral transmission, optical loss.

**Abstract**

On the global market the demands for the quality and, more important, for the level of the special properties of polycrystalline IR optical fibers is rapidly rising. The transition at progressively longer wavelengths requires the use of materials with high refractive index, which, in its turn, implies increasing of the Fresnel reflection at the interface when injecting the radiation into the fiber. In this regard, the issue arises to create the antireflective coatings, which could neutralize this effect. The most promising materials for the manufactuing of crystalline fibers for the spectral range 2.0-25.0 μm are solid solution of silver and monovalent thallium halides. They are the only materials, which the non-hydroscopic polycrystalline infrared fibers for this spectral range can be made from. The emergence of new crystalline AgBr – TlI and AgBr – ($TlBr_{0.46}I_{0.54}$) systems allows delving even further into longer wavelengths, but the refractive index there increases significantly as compared with the AgCl-AgBr system. To monitor the light stability with non-irradiated samples, the transmission spectra were recorded and further used as background for the subsequent spectra of irradiated samples. We researched the process of ultraviolet (UV) irradiation for the crystals of AgBr–TlI and AgBr–$TlBr_{0.46}I_{0.54}$ systems. In this compositions it was found that on the surface of irradiated crystals, the film is formed and film grain size depends on exposure time and crystal composition. This film proved to gain the transmission by reducing the reflection from its surface within the 8.0-27.0 μm range. The approximate conditions of crystals were established. For example, in crystals of AgBr – $TlBr_{0.46}I_{0.54}$ system the antireflection effect can be achieved with the introduction of 1 mol. % $TlBr_{0.46}I_{0.54}$, while for the AgBr – TlI system – at 2 mol. %. For the crystals of AgCl – AgBr system the same effect is not observed, and the optical transmission is decreased in the entire spectral range from 1.4 to 27.0 microns. In addition, the kinetics of the formation process, growth of grains and their number per unit surface of the polycrystalline plate was examined.