# Transient photoinduced optical effects in spin-coated chalcogenide glass thin films

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**Abstract**

Spin-coated thin films of chalcogenide glasses are usually obtained through chemical dissolution of bulk glasses in different amine-based solvents with subsequent spin-coating of the liquid onto silica substrate and appropriate one-stage or multi-stage thermal treatment. Such films are relatively stable to the influence of near bandgap irradiation in comparison with their thermally evaporated counterparts. This property can be very useful, especially for the non-linear optical applications which require high transparency in IR spectral region and minimum sensitivity to the visible light. Structure of thermally stabilized spin-coated films can, in general, be considered as a fragments of bulk glass connected through the residual units of organic solvents. However, increase of anneling temperature promotes direct connections between the glass fragments (through chalcogen atom or newly formed appropriate structural units). The decrease in photosensitivity relatively to the evaporated thin films is linked to the lack of excessive concentration of homopolar bonds in the film structure. At the same time, noticeable shift of optical absorption edge (photodarkening or photobleaching depending on composition) is still observed at irradiation of the spin-coated thin films with super band gap UV light. This change significantly depends on intensity of irradiation and usually contains both metastable and transient components. It is shown on the example of As42Se58 spin coated thin films that by changing post-synthesis annealing conditions it is possible considerably decrease the metastable part of the photoinduced shift of optical absorption edge and obtain pure transient switching effects. Kinetics of the transient changes demonstrates significant deviation from the exponential behavior. Mechanisms of the transient effects are proposed based on the obtained fitting parameters. Possible applications of the observed effects are discussed.

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