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ABSTRACTS

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ANALYTICAL CHARACTERIZATION OF PHOTODARKENING KINETICS IN AMORPHOUS CHALCOGENIDE FILMS

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The kinetics peculiarities of photodarkening in thin amorphous chalcogenide films of different thicknesses (from 0.54 to 4.07 μm), pre-history (virgin and annealed) and chemical composition ($As_{40}Se_{60}$, $As_{50}Se_{50}$ and $As_{60}Se_{40}$) were established in terms of photon-assisted site switching facilitating percolative growth of atomic clusters at ground state [1].

Within this formalism, the final photodarkened sites (independently on their origin), having higher energy, are supposed to be formed from original (start) sites, giving a dynamic intersite balance owing to straightforward (production) and backward (relaxation) reactions. So the overall set of photoinduced defect production-relaxation processes along with initial conditions can be conveniently presented via a scheme:

$$\begin{array}{lcc} & \begin{array}{c}\textit{Start}\\ \textit{state}\end{array} & \begin{array}{c}\xrightarrow{k_p}\\ \xleftarrow[k_r]{}\end{array} \begin{array}{c}\textit{Final}\\ \textit{state}\end{array} \\ t=o & N_t^0 & 0 \\ t=\infty & 0 & N_t^{\infty} \\ t & \dfrac{k_r}{k_p+k_r}N_t & \dfrac{k_p}{k_p+k_r}N_t \end{array},$$

where N_t^o is initial concentration of atomic sites available for relaxation; k_p and k_r are probabilities of precursor trapping and detrapping in final state, respectively.

In the framework of the above scheme, it was established the photodarkening in amorphous arsenoselenide films is non-dispersive in nature, its kinetics description on thickness, thermal pre-history and chemical composition being governed by penetration depth of pumping light beam (value the inverse of the absorption coefficient). The greater penetration depth of pumping light, the smaller non-dispersivity in the resulting photodarkening kinetics.

[1] A. Ganjoo, H. Jain H. *Phys. Rev.* **v. B74** (2006) p. 024201-1-6.