



10th Jubilee

**RAD**

INTERNATIONAL  
CONFERENCE  
ON RADIATION  
IN VARIOUS FIELDS  
OF RESEARCH

*Spring Edition*

June 13-17, 2022  
Hunguest Hotel Sun Resort  
Herceg Novi, Montenegro

**BOOK OF  
ABSTRACTS**

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## BOOK OF ABSTRACTS

10<sup>th</sup> JUBILEE INTERNATIONAL CONFERENCE ON RADIATION IN VARIOUS FIELDS OF RESEARCH (RAD 2022)  
SPRING EDITION | 13-17.06.2022 | HUNGUEST HOTEL SUN RESORT | HERCEG NOVI | MONTENEGRO  
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## On the unified configuration-enthalpic model of radiation-induced functionality in chalcogenide glass-forming systems

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<https://doi.org/10.21175/rad.spr.abstr.book.2022.16.7>

The configuration-enthalpic model grounded on mutually-interrelated configuration-coordinate and enthalpic diagrams is developed to describe the phenomenology of optical responses in chalcogenide glass-formers caused by combined effects of very long physical ageing and high-energy irradiation. The chalcogenide glasses are supposed be stabilized in the ground state and some temporary excited states, the former being presented by tightly interconnected metastable wells (i.e. rejuvenation-induced, irradiation-induced, physically-aged and deep crystalline-like ones) linked by thermally-activated over-barrier and tunneling through-barrier transitions. As an example, effect of high-energy irradiation on arsenosulphide glasses (As-S) is reflected within this model by vertical transitions of atomic sites into excited state followed by spontaneous non-radiative relaxation into irradiation-induced ground state. Approach based on interlinked thermodynamic enthalpic and configuration-coordinate diagrams allows complete parameterization of optical responses related to these states, defined in blue (bleaching) or red (darkening) shifts in the fundamental optical absorptions edge of these glasses. The phenomenological identity of radiation-optical changes obeying competitive changes from many supplemented influences is shown to be completely revealed in chalcogenide glasses of multinary Ge-As/Sb/Bi-S/Se systems.



## On the role of intrinsic free volume in radiation-induced effects in chalcogenide vitreous semiconductors

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<https://doi.org/10.21175/rad.spr.abstr.book.2022.27.3>

Phenomenological description of radiation-induced effects in chalcogenide vitreous semiconductors (ChVS) is critically reconsidered with respect to intrinsic free volume determining compactness of glass-forming network. Destruction of covalent chemical bonds in ChVS under high-energy irradiation (with 1.25 MeV energy, <sup>60</sup>Co source) is accompanied by structural relaxation towards novel metastable state, this phenomenon being known as radiation-induced physical ageing. Within such relaxation occurring via direct interaction of bond-constituting atoms and nearest surrounding neighbors, the pairs of over- and under-coordinated atoms possessing an excess of positive and negative electrical charge appear. Hence, the final optical response in the metastability of ChVS is revealed as combining irradiation-excitation and physical-ageing effects. In this work, we'll analyze the role of structural compactness in the efficiency of relaxation pathways in ChVS of multicomponent Ge-As/Sb/Bi-S/Se glass-forming systems possessing different intrinsic free volumes.

