Nonlinear Effects in Materials Under Irradiation

Group Leader

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Research Activities

Research activities of this group can be outlined as follows :

- Nonlinear feedbacks and phenomena in materials under irradiation.
- Mechanisms of recovery of radiation damage based on the nonlinear interactions in irradiated materials.
- Irradiation as source of noise.
- Theoretical background of radiation modification and radiation stability of multicomponent system.
- The role of nonlinear interdependence of point and dimensional defects in the modification of materials under irradiation

Collaboration

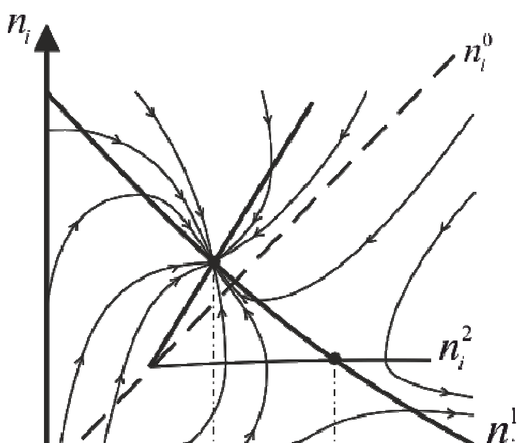
- International collaboration:
  - Research Institute of Advanced Materials and Technologies, Russian Federation.
  - Joint Institute for Nuclear Research, Russian Federation.
  - Seville University, Spain.
  - Heriot-Watt University, United Kingdom.
  - Kiev Institute for Nuclear Research, Ukraine.

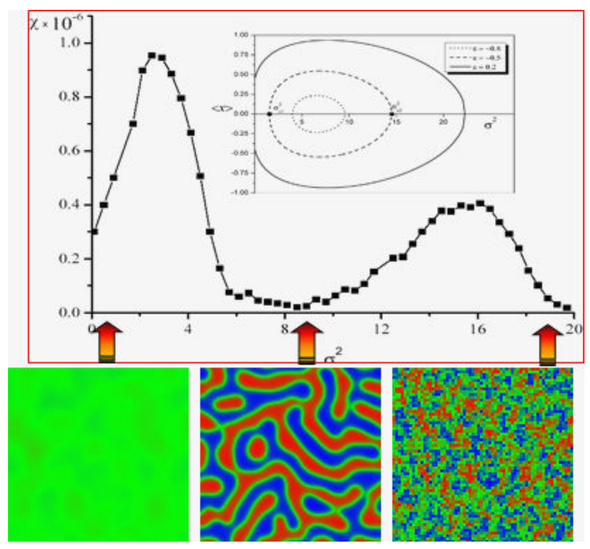
Research Projects

- Peculiarities of creep temperature dependence in irradiated materials.
- Radiation-induced damage of simple polymer molecules.
- Self-oscillation of crystal temperature under irradiation.
- Modality of stationary states of irradiated materials.
- Delayed damage of complex structure molecules under and after irradiation.
- Self-organization point defects under irradiation.
- Radiation-induced growth of second phase in binary alloy.
- Delayed damage of polymer, organic and other complex molecules under and after irradiation.
- Condensation of drops in irradiated steam.
- Stochastic effects in crystal under irradiation.
- Formation of track structure by swift heavy ion irradiation.
- Interaction of heavy large charged ions with materials.

Funding

- NRF





$$\frac{dC_i}{dt} = \frac{K}{1+\Delta} - \frac{C_i}{\tau_i} - 4\pi D_i \int_o^\infty z_i^s(r) C_i f(t,r) r dr - \gamma_o C_i C_v$$

$$\frac{dC_v}{dt} = \frac{K}{1+\Delta} - \frac{C_v - C_v^e}{\tau_v} - \gamma_o C_i C_v - 4\pi D_v \int_o^\infty z_v^s(r)\left(C_v - C_v^{er}\right) f(t,r) r dr$$

$$\frac{dr}{dt} = \frac{1}{r}\left\{D_v z_v^s(r)\left(C_v - C_v^{er}\right) - z_i^s(r) D_i C_i\right\}$$

$$\frac{\partial f(r,t)}{\partial t} + \frac{\partial}{\partial r}\left[f(t,r)\frac{dr}{dt}\right] = 0$$

Recent Publications

Selyshchev P.A., Demchyshyn A.B.:
“Critical Exponents in Percolation Model of Track Region Journal of Nano- and Electronic Physics ” (2012)
Dubinko V.I., Selyshchev P.A., Archilla J. F. R.:
“Reaction-rate theory with account of the crystal anharm onicity” (2011)
Selyshchev P.A.:
“Influence of the radiation-induced formation of clusters on the dynamics of drop size change in atmosphere of own steams” (2011)
Selyshchev P.A., Demchyshyn A.B.:
“The formation of branched structures with separate tracks created by fast heavy ions” (2011)

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