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Radiographic effects during self-irradiation of curium intermetallic compounds

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Considered are changes in the elementary cell volumes versus time at room temperature and annealing behavior of some curium intermetallic compounds with platinum metals (Pt, Ir, Rh and Pd) etc. caused by internal irradiation by alpha-decay products of radioactive component [1,2,3].

The intermetallide x-rays show that with increasing irradiation dose a decrease in the diffraction reflection intensity was observed up to their complete disappearance due to a crystal structure amorphization as well as disappearance of "superstructural" reflections of the Pd₃Cm cubic lattice followed by a reversion (decrease) of the lattice parameter value after several days, and recovery of the crystalline state and initial parameters of the intermetallide crystal lattice under annealing. Swelling of the lattice volume of most of the intermetallides makes up 1% achieving 3.5% in separate cases.

A phenomenological model is proposed which considers peculiar features of trends of the experimental curves (with a maximum change in the physical property). The model is based on the assumption that the evolution rate in the direction of ordering of initial disordered centers is less than that of initial disordering (that is proportional to the irradiation intensity).

[1] Radchenko V.M., Seleznev A.G., Ryabinin M.A. et al., Radiokhimiya, 1994, V. 36, edition 4, P. 299-303.

[2] Radchenko V.M., Seleznev A.G., Ryabinin M.A. et al., Radiokhimiya, 1996, V. 38, edition 5, P. 391-394.

[3] Shimbarev Ye.V., Radchenko V.M., Ryabinin M.A., Vasilyev V.Ya., Radiokhimiya, 1994, V. 36, edition 4, P. 304-307.

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