THE DEPENDENCE OF RADIATION-INDUCED SEGREGATION IN METALS ON THE STRUCTURE OF GRAIN BOUNDARY

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The process of radiation-induced segregation in metals and alloys represents controlled by diffusion non-equilibrium process, which largely defines the behavior of irradiated materials, especially at conditions, which are typical for work of nuclear reactor. Grain boundary segregations have a considerable influence on many properties of materials, and first of all on a mechanical properties and destruction.

During the process of irradiation, a great number of point defects considerably exceeding their equilibrium concentrations appear. At sufficiently high temperatures (0.3-0.5 of melting point) these defects obtain more mobility and diffuse to sinks such as free surfaces, grain boundaries (GB), dislocations etc. The segregation process develops when atoms of material's one compound has preferential coupling with defect flux and results in their enrichment (or depletion) at the boundary surface.

The value of grain boundary segregation is determined by the structure of grain boundaries, which in turn depends on a degree of disorientation of neighbor grains, position of surface and defect structure of boundaries. For correct calculation of grain boundary segregation value it is necessary to find out the fluxes of point defects in strain fields, which appear near boundaries.

In calculations the grain boundary of random disorientation represents the nearest special boundary, which contains the net of grain boundary dislocations. These grain boundary dislocations provide the necessary addition till the required disorientation and create fields of strain, which activate the point defect fluxes. As a result of diffusion near grain boundary dislocations (which vector of Burgers, both intrinsic and extrinsic, is less than for lattice dislocations), the excessive segregations of alien atoms, similar to Cottrell atmospheres on lattice dislocations, appear. Thus, the process of segregation forming and growth on a random GB is first of all controlled not by the degree of disorientation of neighbor grains but by the position of GB surface, i.e. by specific structure of surface of adjacent grains.

RADIOTHERMOLUMINESCENCE OF OXIDE LAYERS BEING CREATED DURING RADIATION-THERMAL OXIDATION IN Al-H_2O SYSTEM

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Radiothermoluminescence (RTL) of oxide layer of aluminum being created during radiation-thermal oxidation in Al- ads. H_2O system between 80-400 K temperature was

investigated. As the research object a metallic of aluminum plates by mark AD-00, was exposed oxidation under γ-radiation at 373 K temperature. Previous samples were vacuumized at T=300 K temperature and $P=10^{-4}$Pa pressure. For RTL analysis of samples radiated till doze 25 kGy by γ-rays ^{60}Co of at 1.03 Gys^{-1} doze rate and 77 K.

Curves RTL were got in TLG-69 thermoluminograph at $5Kmin^{-1}$ warming velocity of samples. Surface condition and oxidation degree were controlled by IRRAS and XPS methods.

Al plates vacuumized, radiation-thermal (RT) oxidated at room temperature were irradiated by γ-quanta at 77K, it leads to the appearance of peaks RTL got at low temperature –170, 230 and 320 K. The most intensive peak at T=170K with activation energy E_a=0.38eV, and also weak peak at T = 230K, it may connect with the generation of unstable O_3^- complex. The generation of O_3^- complex is due to low-temperature adsorption of molecules O_2 - radiation-heterogeneous decomposition product of H_2O surface localized O^- hole center or V^- type one (O^- ion lattice being near cation vacancy).

We think the wide diffusion of RTL peak at 320K with $E_a \approx 0.8$-1.0eV links with the adsorption complexes of H (hydroxyl or ion hydride) being close to anion vacancy with V (V_{OH}, V^-, V_{Al}, and others) type hole center.

While increasing contact time between Al and water radiation-thermal oxidated and the thickness of oxide layers, intensity of peak gets low at 300K, that's proper to the results of the IR- spectroscopic researches.

By increasing the thickness of oxide layer RTL peaks intensity gets high at 170 K, this links with increasing of surface hole center density and formation possibility of oxygen adsorption complexes.

Intensity of the peak given depends on the doze of γ -rays and in the region $2 \leq D \leq 20$ kGy linear correlation is observed between them, in the region $D > 20$ kGy saturation is done. Vacuumization of the samples at 673K makes RTL entirely depress. Thus during studying the contact of RT oxidation of metals with water RTL method can be applied. While the formation of oxide layer the leading role of oxygen was determined.

INFRARED REFLECTION ABSORPTION SPECTROSCOPY STUDY OF RADIATION-HETEROGENEOUS PROCESSES IN THE SYSTEM OF ALUMINUM-HEXANE

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Infrared reflection absorption spectroscopy (IRRAS) was applied to study the regularities of radiation conversion of hexane on the surface of aluminum. The research object was the