

On the Physics of Some Known Diffusion Anomalies in Metallic and Carbonaceous Systems

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1. Introduction

In this contribution, some long-term and recent open questions on the mechanisms (physics) of a number of the known diffusion anomalies in deforming, deformed, nano-structured, amorphous and liquid-solid metallic systems, and also in carbonaceous nano-structures are considered.

2. The Diffusion Anomalies in Question

The contribution includes a constructive critical analysis and re-treatment of the data on: 1) anomalies of diffusion of hydrogen in deformed, nano-structured and amorphous Pd, and also in Fe and steels; 2) anomalies of diffusion of Fe and other transition impurities in Al, particularly, at grain boundaries; 3) anomalies of the self- and solute-tracer diffusion in nano-structured metals and alloys (Ni in Cu and Ni-Fe, Ag in Ni-Fe, ...); 4) anomalies of diffusion processes in intensively deforming metals and alloys, particularly, in the ball milling ones (Ti-Cr, Ni-Zr, Cr-Zr, ...); 5) anomalies of diffusion processes of internal oxidation and nitridation of Fe-Cu and Ni-Cr alloys, particularly, the precipitate coarsening anomalies; 6) diffusion anomalies of the liquid-metal deep etching of the grain boundary regions in Cu-Bi and other systems; 7) diffusion anomalies of the grain boundary faceting in Zn-Al and other systems; 8) anomalies of diffusion of hydrogen in carbonaceous nanostructures (carbon nano-fibers, carbon nano-tubes bundles, etc.), relevance to the hydrogen on-board storage problem.

3. Conclusion

The mechanisms (physics) of these anomalous diffusion processes can be revealed on the basis of using the analytical results [1-9].

The related cooperative study projects are desirable.

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