

## **Diffusion in Nanocrystalline Solids / Abstract**

In the present thesis diffusion in nanocrystalline solids is studied with the use of the continuum/double-diffusivity model that was initially proposed by Aifantis in 1979. The aim of the thesis is for the aforementioned model to be applied in experimental data of diffusion in nanocrystalline and ultra-fine grained solids. In addition, it is proven that the model is capable of adequately describing triple-diffusivity. To the author's knowledge, this has been done once in the past with the use of another model, although, without producing good results. This last observation provides originality in the present thesis. The comments pertaining to the behavior of the phenomenological constants of the continuum model reported in earlier works are confirmed, while some theoretical extensions of older methodologies concerning the application of the continuum model in crystalline solids are presented. Finally, fittings of experimental data on triple-diffusivity in ultra-fine grained solids, and on double-diffusivity in nanocrystalline solids are produced. Wherever possible, the corresponding Arrhenius equations and plots both for the diffusion coefficients and for the phenomenological constants of the model, are provided.