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Analysis of activation energy evolution in thermo-kinetic process of nano-scale grain growth

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Abstract

The grain growth of nanocrystalline materials is a thermo-kinetic process controlled by activation energy and grain boundary energy. With the Arrhenius equation between grain boundary mobility and temperature, the evolutions of activation energy against annealing time in different annealing temperature zones are obtained in nanocrystalline RuAl. It is shown that there is a reducing first and then increasing process in the evolution of activation energy against annealing time. It can be concluded that the low activation energy in the initial period corresponds to a defect recovering and structural reordering period, while high activation energy in the following period is controlled by a diffusion procedure influenced by segregation of solutes or impurities.

Keywords: Nanocrystalline materials; Grain boundary energy; Activation energy; Structural ordering

1 Introduction

It is of technological interest to investigate the grain growth mechanisms of nanocrystalline (NC) materials, for the NC materials have lots of more advanced mechanical, physical and

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