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The Kinetic Parameters of Triple Junction Motion in Aluminium

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Abstract. The motion of triple junctions has been studied. All the triple junctions were formed by the same grain boundaries with different arrangement of grain boundaries at the triple junction point. It has been shown that the kinetic properties of a triple junction are defined by its crystallographic parameters. Namely, the crystallographic parameters govern the kinetics of the elongation of a growing grain boundary in a junction.

Introduction

Recrystallization and grain growth proceed by generation and migration of grain boundaries and triple junctions. It has been shown that grain boundaries and triple junctions do not have similar properties, especially for the kinetics ones [1]. It is indispensable to understand the mechanism which controls the kinetics of recrystallization. Such an information cannot be retrieved from experiments on polycrystals, since they only yield average properties of the polycrystalline system. Therefore, experiments on well defined grain boundaries and triple junctions are needed to elucidate the mechanisms of grain growth. The main goal of this work is to study the motion of an individual triple junction and to determine the effect of each grain boundary on the triple junction motion in Al.

Experimental

High purity (99.999%) aluminium tricrystals were grown by mean of directed crystallization technique. The growth procedure is described in detail elsewhere [2].

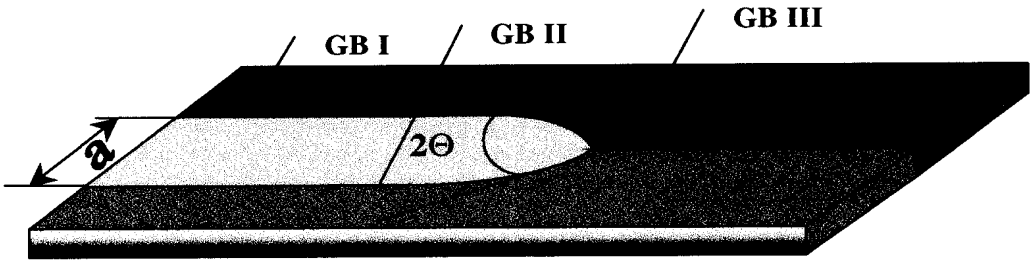

Fig. 1. Scheme of the grain boundary system with a triple junction. GB I, GB II, GB III – <100> tilt grain boundaries with different misorientations; a – width of the middle grain; 2Θ – value of the vertex angle.

A schematic view of the investigated triple junction is shown in Fig. 1. The triple junction consists of three grains having the normal to their surface parallel to the crystallographic direction <100>. Grain boundaries between adjacent grains – GB I, GB II, GB III – are of tilt type.