

# Textures of Materials: Icotom-13 (Materials Science Forum)

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## Recrystallization Texture of a Copper Electrodeposit with the <111> and <110> Duplex Orientation

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**Abstract.** The copper electrodeposits with the <110> and <111> orientations undergo texture transitions to <√310> and <100> orientations, respectively, after recrystallization. However, a weakly developed <110> and <111> duplex deposition texture changes to the <√310> recrystallization texture. The result has been discussed based on the recrystallization rate and tensile strength data of the deposits with the <110> and <111> orientations obtained under similar electrolysis conditions.

### Introduction

Electrodeposits are known to have the preferred orientation or texture. The texture varies with electrolysis conditions, such as bath temperature, cathode current density, bath composition and agitation degree of electrolytes. The texture of electrodeposits is also related to their microstructure and surface morphology, which in turn can affect their mechanical and other properties [1-8]. Therefore, understanding of the texture evolution is very important. The electrodeposits are well known to undergo recrystallization when annealed.

The texture of recrystallized deposits may differ from that of as-deposited state. Studies have been made of the recrystallization textures of copper [9-11], silver [12], nickel [13], and chromium [10] electrodeposits having a simple texture like the <100>, <110> or <111> texture [9,10]. For the fcc metal deposits, the <100>, <110>, and <111> deposition textures change into the <100>, <√310> and <100>, respectively, on recrystallization. The results can be explained by the strain energy release maximization model, in which the recrystallization texture is determined so that the release of the strain energy due to dislocations can be maximized on recrystallization [9,10,14-16].

The purpose of this study is to investigate the recrystallization texture of a copper electrodeposit whose texture can be approximated by a duplex texture consisting of <110> and <111>.

### Experimental Method

Electrodeposition of copper was carried out in a copper sulfate bath consisting of 280g/l CuSO<sub>4</sub>·5H<sub>2</sub>O and 80g/l H<sub>2</sub>SO<sub>4</sub> at 30 to 50°C, with a 316L stainless sheet as cathode and a lead sheet as anode, under various cathode current densities. The cathode sheet was polished with a 2000-grit emery paper to reduce a possible influence of its texture. The distance between the anode and cathode was about 4cm. The baths were regulated within a temperature of 0.5°C without any mechanical stirring. Copper deposits were peeled off from the cathode to be free from the thermal stress when annealed. The thickness of the copper deposits was about 35 μm. The texture of

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