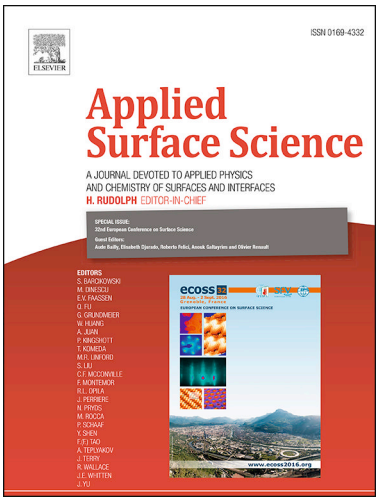

Full Length Article

In-situ xrd-investigation of electrolytic copper layer

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PII: S0169-4332(18)31742-2
DOI: https://doi.org/10.1016/j.apsusc.2018.06.175
Reference: APSUSC 39683

To appear in: *Applied Surface Science*

Received Date: 3 May 2018
Accepted Date: 19 June 2018

Please cite this article as: M. Schneider, M. Weiser, B. Matthey, M. Herrmann, *In-situ* xrd-investigation of electrolytic copper layer, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.06.175

In-situ xrd-investigation of electrolytic copper layer

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Abstract

The present work investigates the approach of the in-situ investigation of the microstructure of electrolytic deposited metal layers by using a conventional x-ray diffractometer. The used electrochemical x-ray cell used allows the reduction of the electrolytic film thickness during the x-ray diffraction to avoid a significant reducing of intensity caused by diffuse scattering. The results reveals the microstructure development of copper layers depending on the layer thickness and the deposition potential. The avoidance of any contamination with an ambient atmosphere and the continuously potential control guarantees steady conditions of the sample surface between the deposition steps and during the diffraction measurement.

Keywords: electrolytic deposition; microstructure; in-situ x-ray diffraction

1 Introduction

The electrolytic copper deposition is considered as the earliest plating technology and was already applied for technical applications in the 19th century [1]. Sulfate copper plating bath are preferably used in the electroforming, for applications in the printing industry and the production of conventional circuit boards [2]. In the 1990s IBM introduced copper as an interconnector material in chip manufacturing (damascene process). The electrolytic deposition has become increasingly important in microelectronics (printed, circuit boards, high density interconnectors [3,4 ,5]). Electrolytic copper layers have outstanding properties (e.g. less residual stress, high electronic conductivity, migration resistance [6,7,8]) . Thereby, most of the relevant properties are strictly dependent on the structure parameter, e.g. crystallite size, texture or micro residual stress) and these again results from the overlapping influence of the substrate and deposition parameter [9]. With increasing layer thickness the influence of deposition parameters increasingly dominate the microstructure as well as the