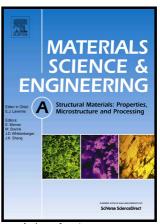
Author's Accepted Manuscript

Thickness dependence of the electro-mechanical response of sputter-deposited Mo thin films on polyimide: Insights from *in situ* synchrotron diffraction tensile tests

Tanja Jörg, Megan J. Cordill, Robert Franz, Christoph Kirchlechner, Daniel M. Többens, Jörg Winkler, Christian Mitterer



www.elsevier.com/locate/msea

PII: S0921-5093(17)30579-8

DOI: http://dx.doi.org/10.1016/j.msea.2017.04.101

Reference: MSA35002

To appear in: Materials Science & Engineering A

Received date: 8 March 2017 Revised date: 24 April 2017 Accepted date: 25 April 2017

Cite this article as: Tanja Jörg, Megan J. Cordill, Robert Franz, Christopl Kirchlechner, Daniel M. Többens, Jörg Winkler and Christian Mitterer Thickness dependence of the electro-mechanical response of sputter-deposite Mo thin films on polyimide: Insights from *in situ* synchrotron diffraction tensil t e s t s , *Materials Science & Engineering A* http://dx.doi.org/10.1016/j.msea.2017.04.101

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

ACCEPTED MANUSCRIPT

Thickness dependence of the electro-mechanical response of sputter-

deposited Mo thin films on polyimide: Insights from in situ synchrotron

diffraction tensile tests

Tanja Jörg^{a*}, Megan J. Cordill^b, Robert Franz^a, Christoph Kirchlechner^{c,b}, Daniel M.
Többens^d, Jörg Winkler^e, Christian Mitterer^a

^aDepartment of Physical Metallurgy and Materials Testing, Montanuniversität Leoben, Franz-Josef-Strasse 18, 8700 Leoben, Austria

^bErich Schmid Institute of Materials Science, Austrian Academy of Sciences, and Department of Materials Physics, Montanuniversität Leoben, Jahnstrasse 12, 8700 Leoben, Austria

^cMax-Planck-Institut für Eisenforschung GmbH, Max-Planck-Strasse 1, 40237 Düsseldorf, Germany

^dHelmholtz-Zentrum Berlin für Materialien und Energie, Albert-Einstein-Strasse 15, 12489 Berlin, Germany

^e Business Unit Coating, PLANSEE SE, Metallwerk-Plansee-Strasse 71, 6600 Reutte, Austria

*Corresponding author. Tel.: +43 3842 402-4229; fax: +43 3842 402-4202.

E-mail address: tanja.joerg@stud.unileoben.ac.at (T. Jörg).

Abstract

The *in situ* characterization of the deformation and fracture behavior of brittle metal films is of great technological interest for many modern applications. A prominent example is the field of flexible electronics, which rely on the electrical and mechanical integrity of metal thin films on compliant substrates when exposed to straining or bending. Within this work, failure mechanisms, such as cracking and buckling, were studied as a function of film thickness and correlated with the elastic-plastic material response during straining. Mo thin films were synthesized with thicknesses between 40 and 500 nm on polyimide substrates using an industrial scale in-line direct current magnetron sputtering system. *In situ* synchrotron X-ray diffraction was employed to determine the evolution of lattice strain and film stress during uniaxial tensile straining while simultaneously measuring the change in electrical resistance. The results highlight that the electro-mechanical properties of Mo thin films scale with the

Download English Version:

https://daneshyari.com/en/article/5455744

Download Persian Version:

https://daneshyari.com/article/5455744

<u>Daneshyari.com</u>