CICLO DE SEMINARIOS 2011

SMAT-C Soft Matter Research and Technology Center

"Mechanical Stability of thin self standing films, and film on substrate systems"

Dr. Michel Ignat

On leave at Department of Physics, FCFM, U. Chile - CNRS (R) SIMAP, Grenoble-INP, France

Obtaining the mechanical properties for materials consisting on nanometre scale microstructures (MEMS, NEMS) is nowadays a challenging research objective. Mechanical parameters, such as Young's modulus and the flow and failure stresses, are needed to predict device's reliability and safe design. Moreover, it is worth noting that contrary to the case of bulk materials, for thin films, a lack of information on their mechanical properties will permanently subsist. Indeed, because their mechanical properties are dependent on the microstructure, which is induced by the deposition process; different microstructures which can be obtained for the same material (characterized for instance by the ratio of film thickness to surface roughness, or to grain sizes and cristallinity) may produce rather different mechanical responses.

We performed tensile experiments and in-situ observations on submicron thick Al films. Their stress vs strain response, showed a short hardening stage, followed by an extended softening stage. The development of deformation bands with progressive and regular cooperative grain boundary sliding, along the directions of maximum shear was then observed.

In order to analyse if the observed deformation bands, could be related to a discontinuous grain growth and/or coarsening/recristalizacion (as it has been recently reported in literature), extensive TEM observations before and after the deformation experiments, were carried out. The TEM analysis was associated with special software which allows mapping the orientations of the grains and also determining with accuracy the grain size distribution and the possible reorientation of the grains.

The results are discussed regarding the distribution of stresses in the film and taking into account the observations of the microstructural evolution, carried out at a lower scale.

MARTES 28 JUNIO, 13:00 HORAS

Sala de Conferencias, Tercer Piso, Departamento de Física
Universidad de Santiago de Chile

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