DIELECTRIC PROPERTIES OF THIN FILMS BY ELECTROSTATIC FORCE MICROSCOPY

G.M. Sacha[(a)], A. Verdaguer[(a)], F. Ogletree[(a)], M. Salmeron [(a)],
E. Sahagún [(b)] and J.J. Sáenz [(b)],

[(a)] *Materials Science Division. Lawrence Berkeley National Laboratory, University of California, Berkeley, California 94720*
[(b)] *Departamento de Física de la Materia Condensada and Instituto "Nicolás Cabrera", Universidad Autónoma de Madrid, E-28049 Madrid*

A detailed analysis of electrostatic interactions between a dc-biased tip and a dielectric thin film on a metallic sample is presented. We develop a direct inversion method to determine the dielectric properties and thickness of insulating thin films. The method is based on a calculation of an extended Capacitance (C), Force (F) and Force-gradient (F') versus distance (D) curves database for different thin film thickness, dielectric constants and tip-shape parameters. The database is calculated following the Generalized Image Charge Method (GICM) [1]. The inversion method is used to extract different properties of Langmuir-Blodget films on gold samples from Electrostatic Force Microscopy experiments.
For inhomogeneous thin dielectric films, the scanning probe signal is shown to be proportional to the convolution between an effective surface profile and a response function of the microscope [2]. Based on the properties of the response function, tip-shape effects on the lateral resolution in electrostatic force microscopy are discussed.

References:

[1] S. Gómez-Moñivas, L.S. Froufe, A.J. Caamaño and J.J. Sáenz. Appl. Phys. Lett. **79**, 4048 (2001)
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