Faculty of Electrical Engineering & Computer Science
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Characterization of Electrical and Elastic Properties of Sputtered Metallic Films.

ABSTRACT - Masterthesis

Deposition of thin films by sputtering is one of the basic fabrication technologies of Microelectronics and Microsystems. The structure of thin films grown by sputtering differs significantly from the structure of bulk material but very often the possible differences in material properties due to different structure are neglected. For instance, the thickness of a metallic film is typically monitored by measuring the sheet resistance but this is only valid, when the resistivity of the film is identical to bulk resistivity. Also mechanical properties like Young's Modulus, internal friction and internal stress and the diffusion coefficient depend on the microstructure of the film. The structure itself depends on the deposition parameter of the sputter process and it might change by annealing processes at rather low annealing temperature.

Part of the microstructuring lab at the Hochschule Bremen is a DC-magnetron-sputtertool which offers the opportunity to sputter different metallic films. In this master thesis the properties of sputtered films and the influence of deposition parameters onto these properties are investigated. For characterizing the sheet resistance, a 4-point probe is used. The Young`s modulus and the internal friction are investigated by measurements of micromechanical Silicon Cantilevers on which the films have been sputtered. Therefor an optical measurement system for eigenfrequencey and damping of cantilevers was developed in a previous thesis. The internal stress of these films can also be detected with this system by measuring the curvature of the cantilever and in addition by a profilometer. The profilometer has also been used to measure thickness and surface roughness of the films.