RAYLEIGH WAVE PROPAGATION IN THIN FILMS

Agus Ananda

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Advisor: Barry T. Smith, Research Associate Professor of Applied Science

Abstract

An acoustic microscope has been built to study mechanical properties of thin films. The microscope operates at a nominal frequency of 50 MHz. Rayleigh surface wave velocities on the surface of film-substrate systems were measured from V(z) curves generated by the acoustic microscope. V(z) curves are produced from interference between Rayleigh surface waves and the specularly reflected waves. Technologically important materials, non-stoichiometric titanium nitride films and diamond films, were fabricated by using magnetron plasma deposition and hot filament chemical vapor deposition on Si (100) and Si (111) substrates. Spectra from X-ray Photoelectron Spectroscopy were used to determine chemical composition of the films and Scanning Electron Microscope micrographs were taken to study the morphology of the films. Rayleigh surface wave velocity measurements on TiN_x films show a sharp increase in velocity at x=0.7. A comparison with the phase diagram of TiN_x suggests that the sharp increase in velocity might be due to a crystal structure transition from tetragonal ε-TI_2N to fcc δ-TiN.