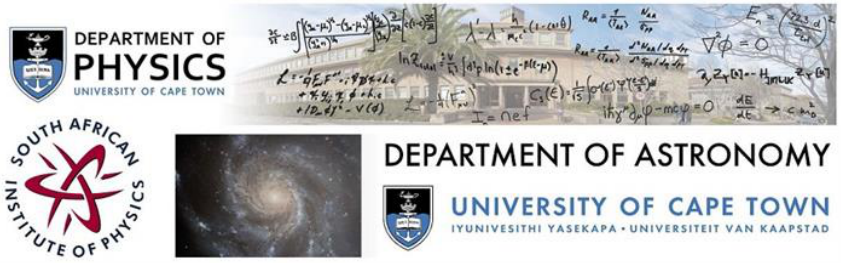

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Surface Brillouin Scattering studies of Transition metal nitrides thin films deposited by RF Magnetron Sputtering

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Abstract content
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Transitional metal nitrides thin films have been intensively investigated owing to their attractive mixture of physical, chemical and mechanical properties. Among these thin film coatings, Niobium nitride (NbN) is a promising candidate material for applications such as single photon detectors, Josephson junctions and diffusion barriers against copper migration. Tantalum nitride (TaN) thin films have also received interest in recent years because of their inherent properties such as good thermal stability and low electrical resistivity. In this work, NbN and TaN thin films have been deposited on etched (100) Si substrates using RF magnetron sputtering at working pressure of 8.5 × 10-4 mbar. Sputter powers ranging from 75W to 250W were used for NbN thin films and 150W for TaN thin films. The effect of sputter power on the microstructure and subsequently on the elastic constants of the NbN thin films is investigated. The microstructure of the thin films has been determined using a combination of grazing incidence x-ray diffraction (GIXRD) and scanning electron microscope (SEM) and correlated to deposition conditions. X-ray reflectivity (XRR) measurements have been used to study the layer mass density, and layer thickness of some select films. Atomic surface microscopy (AFM) has been used to determine the surface topography of the films for surface Brillouin measurements. A time of flight spectrometer for heavy ion detection (HI-ERD) thin film analysis has been used to establish the stoichiometry of the films. Surface Brillouin scattering spectra were gathered for the NbN and TaN samples using the 514.5 nm line from an argon-ion laser operating in a single axial mode. Theoretical modelling based on the surface Green's functions has been used to predict and compare surface Brillouin spectra with the experimental spectra for select thin films. The elastic constants of the films will be extracted using the results obtained from the SBS experiments.

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