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# Characterization of Transition metal nitrides thin films deposited using RF Magnetron Sputtering

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## Abstract content <br>   (Max 300 words)

Thin hard films of transition metal nitrides have been successfully explored and used in the past due to their properties such as high hardness, biocompatibility, wear and corrosion resistance, and thermal stability. Substrate bias can be used to control and improve the thin film properties such as adhesion, intrinsic stresses, and hardness. In this work, NbN and ZrN thin films have been deposited on etched (100) Si substrates at sputter power ranging from 75W to 300W using RF magnetron sputtering at varying substrate bias. The effect of sputter power and substrate bias on the microstructure and subsequently on the elastic constants of the thin films is investigated. The microstructure of the thin films has been determined using a combination of x-ray diffraction (XRD) and transmission electron microscopy (TEM) and correlated to the deposition conditions. X-ray reflectivity (XRR) measurements have been used to study the surface and interface roughness, surface density gradients and layer density, and layer thickness of some select films. For surface Brillouin measurements the surface topography of these films has been examined by scanning electron microscopy (SEM) and atomic force microscopy (AFM). A time of flight spectrometer for heavy ion detection (HI-ERD) thin film analysis has been used to measure the films' thickness and stoichiometry for the various deposition conditions. For the surface Brillouin measurements, a backscattering geometry was used for measuring the laser light inelastically scattered by surface acoustic waves (SAWs) through the surface ripple mechanism. The spectra were excited using the 514.5 nm line of an argon-ion laser operated in a single axial mode. The scattered light was analysed by means of a Sandercock (3 + 3) pass tandem Fabry-Perot interferometer. 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.


## Apply to be<br> considered for a student <br>   award (Yes / No)?

Yes

## Level for award<br> (Hons, MSc, <br>   PhD)?

PhD

## Main supervisor (name and email)<br>and his / her institution


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## Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?

No

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