# EOP Master's Defense
## Wednesday, August 14, 2019

Fitz Hall 568 at 10:00AM
All are welcome to attend.

# Growth, Optimization, and Characterization of Transition Metal Nitrides and Transition Metal Oxides for Electronic and Optical Applications

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Abstract

The next generation of electronic and optical devices require high quality, crystalline materials in order to obtain relevant properties for novel devices. Two classes of materials that offer unique properties that satisfy some of the requirements for next generation devices are transition metal nitrides (TMNs) and transition metal oxides (TMOs). These materials offer properties that range from metallic to insulating. However, many of the potential applications require highly oriented, crystalline, materials.

This thesis examines the growth and characterization of the TMN materials AlN and ScN as well as the TMO materials VO2 and TiO2. In all of these materials, the crystalline structure plays and extremely important role in the desired properties. In addition, incorporation of impurities and defects can potentially have a detrimental impact on the functionality of these materials. In order to minimize the impurity incorporation and maintain the crystalline structure, the growth of AlN, ScN, VO2, and TiO2 films by various deposition techniques were examined and optimized. This study also partially explored the degree to which the TMN and TMO films were influenced by growth conditions, thereby allowing optimization of the relevant optical, electronic, and structural properties. This resulted in high quality film growth and optimized deposition parameters.

The presented work focuses on first understanding the basic properties of the TMN and TMO materials grown in this thesis. Next, an explanation of the growth and characterization methods is provided as a background for subsequent analysis. The growth and characterization of the ScN and $VO_2$ films deposited on $Al_2O_3$ are discussed in detail. Last, potential avenues of further exploration in these materials are examined.