



Western University
Department of Physics and Astronomy

PHYSICS & ASTRONOMY COLLOQUIUM

Date: **Thursday, 28 January 2021**

Time: **1:30 p.m.**

via Zoom: <https://westernuniversity.zoom.us/j/99867746664?pwd=Vm8xSXBzWVA5UXhmN0pyZGVSSDU1UT09>

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“Applications of Atomic Layer Deposition in nonlinear optics and 2D materials”

ABSTRACT

Atomic layer deposition (ALD) is a thin film deposition technique which can be used to grow highly conformal thin films with sub-nanometer thickness control. In this talk I will present examples of TiO₂ thermal ALD films in two distinct areas: nonlinear optics and 2D materials. In both cases, the films are deposited from tetrakis dimethyl amino titanium (TDMAT) and H₂O.

The third order nonlinear response of TiO₂-based films is investigated using thermally-managed Z-scan technique. Some of the as-deposited films exhibit very high nonlinear response which is orders of magnitude higher than conventional nonlinear optical materials, such as silica fibers and CS₂. This extraordinary nonlinear optical behavior of the TiO₂ ALD films is linked to the presence of a very small atomic percentile of TiN bonding in the film.

We also combine experimental and computational approaches to study the thermal ALD of TiO₂ on MoS₂ surfaces. MoS₂ surfaces are hydrophobic and unsurprisingly, depositions on monolayer MoS₂ flakes result in discontinuous films. I will describe various approaches to change the surface energy and to accomplish the deposition of continuous TiO₂ films with nominal thickness 6 nm. As a result, we provide a pathway for the deposition of high quality ALD dielectrics on the MoS₂ surfaces, which is required for the successful integration of these 2D materials in functional devices.

Host: **Prof. L. Goncharova**