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Warsaw-4-PhD
Warsaw Doctoral School
in Natural and BioMedical Sciences

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FOR ACADEMIC EXCHANGE

The Warsaw PhD School in Natural and BioMedical Sciences
and the Institute of High Pressure Physics PAS cordially invite you to
a **SPOTLIGHT TALK**

Enhancing Functionality of Nitride Semiconductors: Examples of Aluminum Boron Nitride and Aluminum Scandium Nitride

given by

Prof. Joseph Casamento

Massachusetts Institute of Technology, Department of Materials Science and Engineering, USA

on October 15th, 2024, 2:00 p.m.

at the IHPP PAS New Technologies Building,
Al. Prymasa Tysiąclecia 98, seminar room, 2nd floor
Duration: 60+ min

and online via Zoom:

https://us02web.zoom.us/j/8352053896?omn=82618661103

All Warsaw-4-PhD students (and others) are very welcome!

Abstract

Nitride semiconductors have enabled transformative technologies that have changed the way people live their lives. They are pivotal components of a plethora of optical, electronic, and photonic devices, and their share in the expanding global semiconductor market is growing. Specific technological examples include use as light emitting diodes (LEDs) in solid state lighting, displays and cell phones, and blue to ultraviolet lasers. They also find use in radio-frequency (RF) filters and in bulk and surface acoustic wave resonators and transistor

amplifiers in the form of high electron mobility transistors (HEMTs).
The ability to expand the chemistry and functionality of nitride semiconductors opens up new technological platforms. In this talk, I will discuss avenues to enhance the functionality and utilization of the nitride materials family by alloying with novel transition metals to generate novel properties. New technology spaces enabled by magnetic, thermoelectric, and superconducting properties from novel nitride materials will be introduced. A specific focus will be on the aspects of electronic response and implications on polarizability of novel nitrides such as aluminum scandium nitride (Al,ScN) and aluminum boron nitride (Al,BN). Highlights of this work include enhanced piezoelectric response and dielectric permittivity in epitaxial layers, ferroelectric HEMT performance, and ferroelectric behavior below 10 nm thickness at back end of line (BEOL) compatible growth temperatures. This emerging research area capitalizes on significant opportunities for materials discovery, heterostructure design, and device simulation and fabrication.