



Andres de Luna (UNAM)

September 18, 2023 to September 22, 2023

CFATA. Queretaro, Mexico

Biography:

Andres de Luna earned his Ph.D. in Physics from the University of Paris 11 in 2011, where his main thesis work focused on the study and application of gallium nitride (GaN) nanowires. He then pursued his first postdoctoral research at the Neel Institute (Grenoble, France), investigating excitonic transport properties in one-dimensional zinc oxide (ZnO) structures. Subsequently, he conducted a second postdoctoral research at Northeastern University (Boston, USA), to work on a project related to the synthesis of two-dimensional materials. In 2015 he joined CINVESTAV Queretaro under the program of Catedra Conahcyt. He has been an associated researcher at CFATA since 2021 and currently serves as the team leader of the 2D materials lab.

Lecture: "An introduction to excitons in semiconductors"

The lecture "An introduction to Excitons in Semiconductors" explores the world of excitons and their significance in the realm of semiconductor physics. Excitons, which are bound electron-hole pairs, play a crucial role in understanding the optical and electronic properties

of various semiconducting materials as well as the development of novel excitonic devices.

The lecture begins by introducing the theoretical framework of excitons, emphasizing their fundamental characteristics and formation mechanisms. One of the key aspects discussed in this lecture is the binding energy of excitons, representing the strength of attraction between the electron and hole, which plays a pivotal role in determining the stability and properties of these bound electron-hole pairs. Various factors influencing the binding energy are analyzed, highlighting its significance in optoelectronic applications. Finally, practical examples of a III-V semiconductor and a layered semiconductor will be discussed, emphasizing their differences and exploring how the binding energy can be tailored.

Seminar: "Atomically thin semiconductors: from synthesis to optoelectronic applications"

This seminar will focus on the synthesis and optoelectronic devices based on atomically thin semiconductors, especially transition metal dichalcogenides (TMDs). The discussion will begin with an exploration of the synthesis using chemical vapor deposition, followed by an in-depth examination of the structural and optical properties of various TMDs. Then, we will explore the integration of metallic metasurfaces as an approach to control the polarization of photoluminescence (PL) emission of a single layer of MoS₂, offering precise manipulation of light. In addition, the seminar will showcase the performance of a hybrid MoS₂/SnS broadband photodetector and our last work on ReS₂/MoS₂ vertical heterostructures for photodetection.