Volatile Organic Compound Detection with Nanostructure-Embedded Resistive Sensors

Speaker: *Prof. José Pedro M. Serbena*

joseserbena@ufpr.br

Gas sensors are widely recognized as simple and cost-effective tools for detecting and quantifying volatile organic compounds (VOCs). They operate based on the principle of gas adsorption onto the surface of the active material. Because these materials directly interact with the analyte, their selection, preparation, and study play a crucial role in designing high-performance gas sensors. Particularly, nanostructured sensors offer interesting features such as quantum effects, tunable porosity, and a high surface-area-to-volume ratio. These characteristics can result in enhanced chemical reactivity and improved mechanical, optical, electrical, and magnetic properties compared to bulk materials. In recent years, there has been significant attention devoted to different nanomaterials like graphene, boron nitride, among others, for gas-sensing applications. These materials present a substantial surface-to-volume ratio and high chemical stability. Their nanoscale structure restricts current paths, with the surface response to target gases directly influencing their gas-sensing properties. In this talk, some results of VOC sensors based on 1D, 2D, and 3D materials fabricated within the Organic Optoelectronic Devices Research Group at the Universidade Federal do Paraná will be presented. This includes the characterization of sensing materials and analysis of sensor performance by integrating material and sensor characterization, alongside electrical impedance spectroscopy analysis.