VISPEC 2026 Doctoral School

Lecture: *Raman, SERS and other "vibrant" approaches to environmental sensing*

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Advances in vibrational spectroscopy are reshaping how we detect, identify, and quantify chemical species in complex environmental matrices. This lecture will explore Raman spectroscopy, surface-enhanced Raman scattering (SERS), and related spectroscopic approaches as powerful tools for environmental sensing. Emphasis will be placed on the fundamental principles and strategies that rule the design of sensors for detecting analytes in complex matrices, overcoming challenges posed by heterogeneity, interference, and real-world deployment. Through selected case studies, the lecture will illustrate applications addressed to the detection of pollutants, emerging contaminants, and biological markers. By bridging spectroscopy, materials science, and environmental analytics, this lecture aims to provide doctoral researchers with both a conceptual framework and practical insight into how vibrational spectroscopies can contribute to next-generation environmental monitoring and sustainable decision-making.