

Hind BENZIDI^{1*}, Timm Swodoba², J. Rodriguez-Viejo^{2,3}, N. López¹, M. Sledzinska²

¹Institute of Chemical Research of Catalonia (ICIQ), The Barcelona Institute of Science and Technology (BIST), Tarragona, Spain.

²Catalan Institute of Nanoscience and Nanotechnology (ICN2), Barcelona, Spain

³Physics department, Autonomous University of Barcelona (UAB) Campus UAB, Bellaterra, Barcelona, Spain

hbenzidi@iciq.es

Machine Learning-Assisted Denoising of Raman Spectral Maps

Abstract

Raman mapping provides spatially resolved information about the chemical and structural properties of materials. However, acquiring high-quality spectra across large areas can be time-consuming, while shorter acquisition times often produce noisy measurements that complicate spectral interpretation. Denoising approaches must therefore reduce noise while preserving meaningful spectral features and spatial variations. Here, we present a machine learning-assisted workflow for denoising Raman spectral maps. The workflow processes spectra within a map to improve signal clarity and facilitate visualization of spatially resolved Raman features. Particular attention is given to preserving peak positions, spectral profiles and relative intensity variations, while avoiding the introduction of artificial features. Performance is assessed through comparisons of raw and processed spectra, together with an examination of the corresponding Raman intensity maps. This work aims to support more efficient analysis of noisy Raman mapping datasets and improve the accessibility of spectral processing through a user-oriented interface. Further validation across different samples and acquisition conditions will establish the scope and limitations of the approach.

