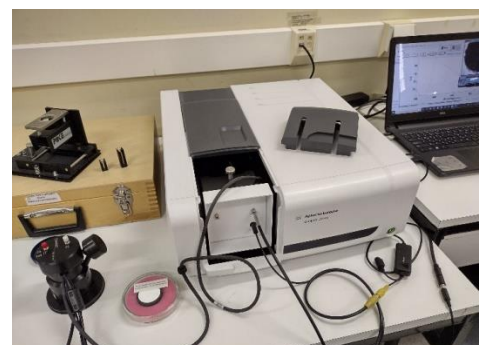


RESEARCH OBJECTIVE

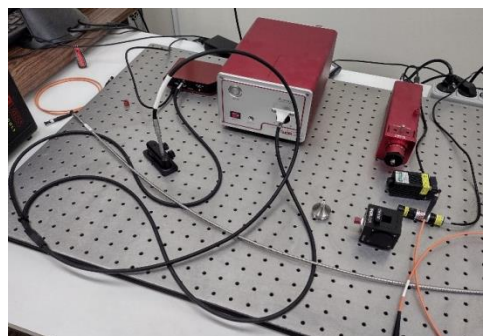
The laboratory's research activity aims at the development of nanostructured photonic materials based on metal oxides, plasmonic nanoparticles and carbon nanometaterials for energy and environmental applications (photocatalytic decomposition of pollutants, H₂ production, solar cells). Research is focused on tailoring nanomaterials morphology and structure for efficient light harvesting in combination with the control of their electronic and optical properties through targeted synthetic modifications in order to optimize materials' performance for photoinduced processes. The latest research direction is the development of advanced dielectric substrates to enhance Raman scattering (Surface Enhanced Raman Scattering – SERS) through photonic nanostructures for application as sensors for the detection of organic substances and biomolecules offering photocatalytic self-cleaning and reuse functionalities.

LAB INSTRUMENTATION

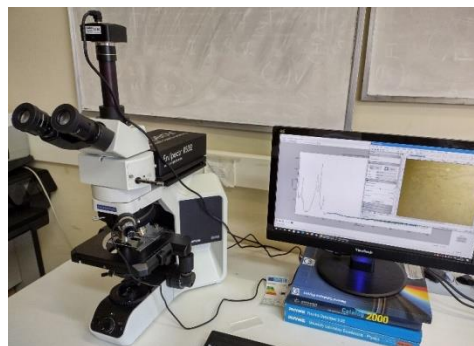
Optical spectrometer UV-Vis Agilent Cary 60 equipped with optical fiber diffuse (Barrelino) and specular (PIKE, UV-Vis 15Spec) reflectance accessories.



Fiber optic spectrometer (CCS200) equipped with stabilized deuterium (SLS204, 200-700 nm) and tungsten-halogen (SLS201L/M, 360-2600 nm) fiber optic light sources, laser diodes at 405, 450, 532, 648 nm and optical accessories (optical fibers and adapters, collimation optics, lenses, quartz micro-cuvettes and holders).



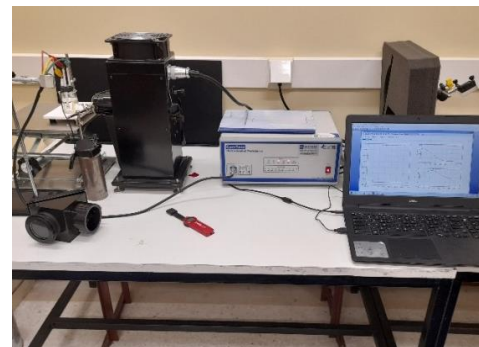
Micro-Raman spectrometer (EnSpectr RamMics M532 Raman) at 532 nm, spectral range 100-4000 cm⁻¹, coupled with a BX43 Olympus microscope.



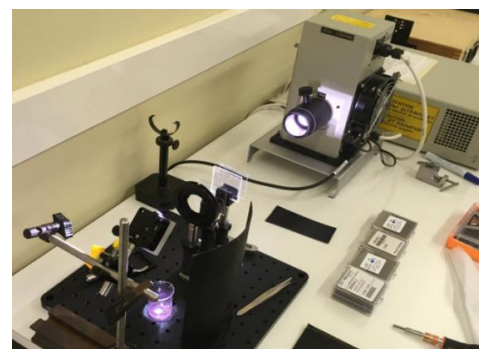
FT-IR spectrometer (Jasco FT/IR-470 Plus), spectral range 400-4000 cm^{-1} , coupled with closed cycle helium cryostat for measurements in the temperature range of 20-300 K, and attenuated total reflectance (ATR) accessories with single reflection Diamond/ZnSe (MIRacle single reflection ATR) and multiple reflection KRS-5 (PIKE Multiple Reflection HATR) crystal plates.



Photoelectrochemical unit with Xe lamp 300 W (TOP-X300) and potentiostat/galvanostat (CS350) with built-in frequency response analyzer (FRA) that supports electrochemical impedance measurements (10 μHz – 1 MHz) and accessories (electrodes, cell, filters).



Xenon light source 150 W (ORIEL 6255/66055) in combination with optical components (filters, mirrors) for photocatalytic activity evaluation. Wireless power meter with thermal sensor (Thorlabs PM160T), spectral range 190 nm - 10.6 μm . Optical microscope BRESSER Science TRM 301.



Materials preparation: analytical balance (Kern ALS 160-4A), heating magnetic stirrers, ultrasound bath, volumetric flasks/cylinders, beakers, adjustable volume pipettes, spin coater (Ossila).