



Research Focus of the Lab of Applied Molecular Spectroscopy

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The specific targets & strategic plan of the **Laboratory of Applied Molecular Spectroscopy (LAMS) of FORTH/IC-HT**, with the vision to next research steps, mainly include the optimization of current research activities, the development of novel approaches and the address of **specific challenges**.

Experimental risk assessment of High Aspect Ratio & Multicomponent Nanomaterials (NMs):

Physico-chemical characterization towards comprehensive intelligent testing of nano-enabled materials and safe by design strategies (from science to regulation).

Detection of emerging contaminants: Reveal Surface Enhanced Raman Scattering (SERS) as an innovative analytical method for detection & monitoring of polyfluorinated substances (PFAS). Development of novel approaches/SERS substrates. Associate already developed & implemented SERS strategies with new ones. Combine the optimized collection of SERS light with the formation of adjusted SERS hot spot spacing or even with the arrangement of the plasmon resonance to match the Raman resonance of the analyte(s). Design & synthesis of novel metal-organic frameworks (MOFs) active substrates suitable/adaptable for the challenging detection of PFAS with the SERS.

Stabilization of colloidal SERS substrates: Investigation of chemically different surfactants and exploit novel strategies for SERS colloidal stabilization.

Regeneration of both colloidal & solid SERS substrates: Evaluation of the effectiveness of Cold Plasma technology to regenerate solid/colloidal SERS substrates towards their sustainable reusability.

Menisci degeneration - polarized Raman spectra as differential diagnosis indicator: An innovative spectroscopic method proposed as a fast-decision-making process for the evaluation of menisci degradation. Compact portable Raman microscopy on tissue sections can be used intra-operatively for fast diagnosis and hence, accurate procedure design in/next to the operating room.

Tuning the Spin Crossover (SCO) Compounds behavior: Intended synthesis and incorporation in polymeric composites exhibiting preferable SCO features as temperature sensors in refrigerated food safety applications. Initiation of temperature dependent Raman measurements.

Protective panels: Assessment of the impact and stabbing on materials at the molecular level *via* a novel hybrid spectroscopic-microscopic method correlating the energy dissipation of bullet and/or stub on protective textiles with the orientation relaxation during the impact. To better understand the role of each layer in the structure and in particular, to better connect with the application, to enable the design of optimized structures, *specialized/qualified modeling studies are required to be involved*.

Breathable polyolefin films as industrial/construction roofing membranes: Development of breathable composite films established on a polypropylene matrix & specific carbon-based NMs.

Fabrics for Single Stage Dyeing with Reduced Environmental Impact: Elucidation of the adhesion mechanism associated with cationic polymers applied to cotton fibers, to facilitate and differentiate their dyeing process, minimizing the cost and their environmental impact.

REFERENCES

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