



Ca' Foscari  
University  
of Venice  
Department of  
Molecular Sciences  
and Nanosystems

## **Juan Carlos Colmenares Quintero**

Institute of Physical Chemistry, Polish Academy of Sciences

# ***From Sonophotocatalysis to Piezo-Photoredox: Breakthrough Materials Approaches Enabling Concurrent Organic Synthesis and $H_2/H_2O_2$ Generation***

**April 21<sup>st</sup>, 2026, at 11.00 a.m.**

Conference Room Orio Zanetto, Alfa Building

Under the banner "From Sonophotocatalysis to Piezo-Photoredox", Prof. Colmenares's team designed multi-dimensional composites of carbon supports, plasmonic nanoparticles and piezoelectric oxides. They used simple synthesis routes to embed single Cu atoms in graphitic carbon nitride, narrowing its band gap and enabling almost quantitative oxidation of benzyl alcohol to benzaldehyde while co-producing hydrogen peroxide.

Defect engineering via mixed precursors increased mesoporosity ( $26 \rightarrow 134 \text{ m}^2 \text{ g}^{-1}$ ) and improved charge separation, boosting  $H_2O_2$  generation. A sonophotocatalytic  $CuBi_2O_4/TiO_2$  heterostructure in continuous flow achieved high selective oxidation of lignin-derived coniferyl alcohol. These advances herald new piezo-photoredox pathways for sustainable organic synthesis and solar hydrogen.