

Chemistry for Environment, Energy and Sustainability



Research Day UNICAM
Camerino 12 dicembre 2024



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Research Groups: Analytical Chemistry, Environmental Chemistry, Physical Chemistry

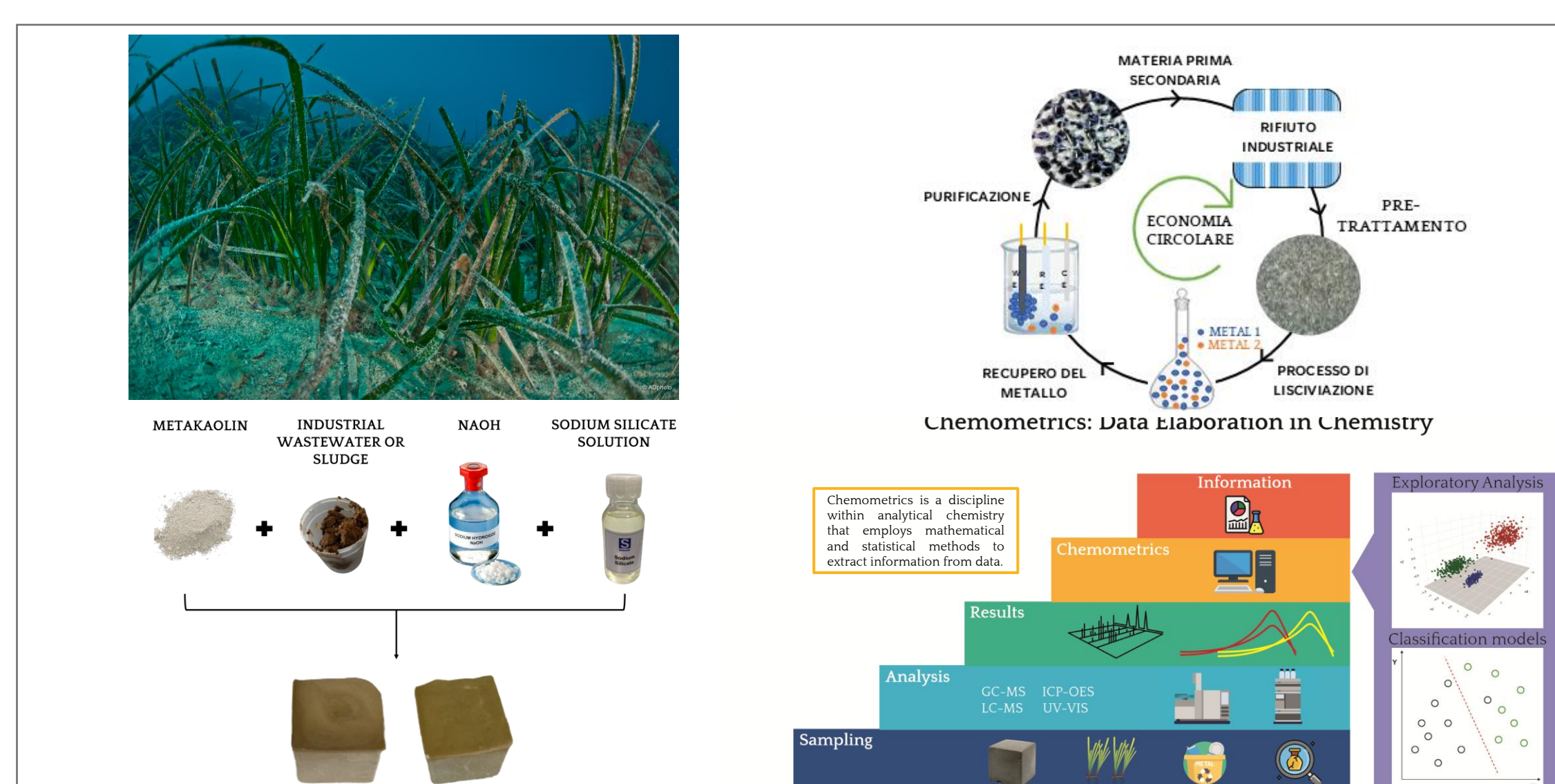
School of Science and Technology

Recovery of waste materials, Pollution, Nanomaterials, Energy storage and conversion, Circular economy, Carbon capture, Green procedures



Abstract

Sustainability means conserving the use of resources such as habitat, raw materials, energy or human labor. Sustainability can only be achieved if it is pursued on three levels: environmental, economic and social. In this approach the three areas of chemistry address three different aspects, such as energy, circular economy and environmental remediation that take into account this message.

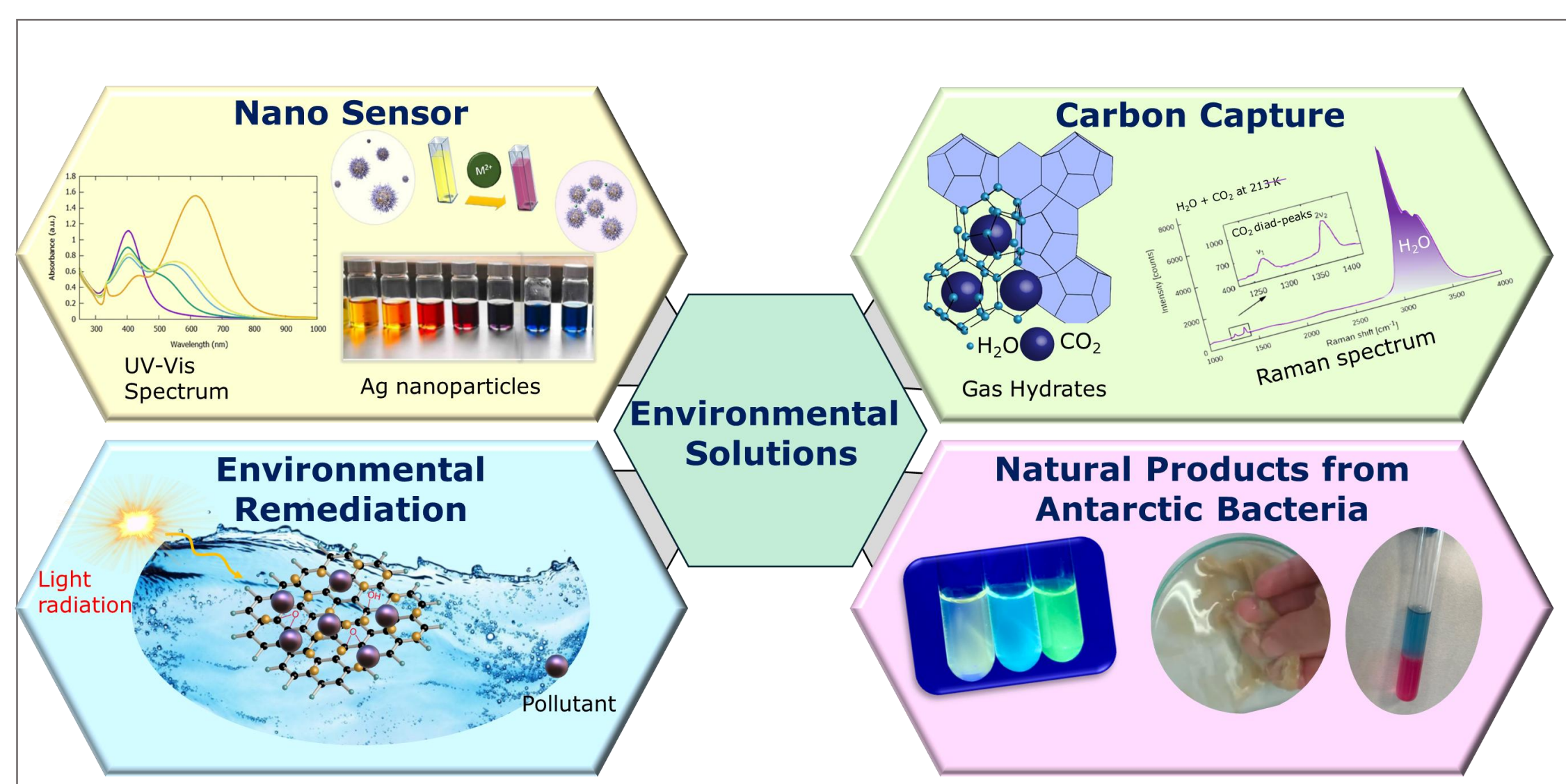


Analytical Chemistry

- Characterization of marine sediments: to establish the marine health related to the Posidonia Oceanica meadow
- Metals recovery from waste: the shortage of some elements requires their recovery from waste
- Waste sequestration and stabilization: the use of geopolymers to trap pollutants present in industrial wastewater is a valid alternative to their traditional disposal
- Archaeometry: Chemical characterization of cultural heritage finds
- Electrochemistry: Hydrogen storage in metals

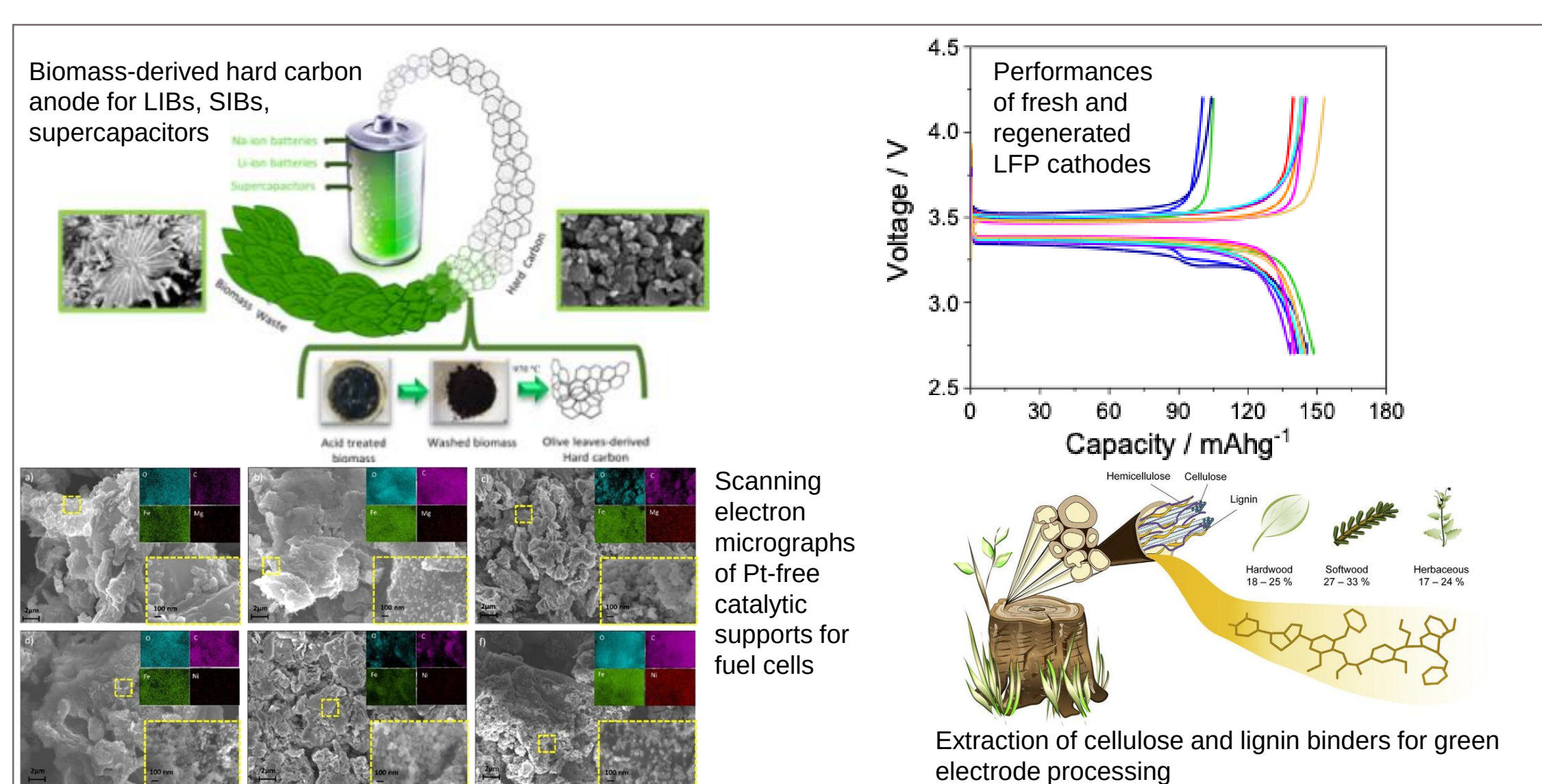
Environmental Chemistry

- Nano Sensors: Wastes valorization for the Green synthesis of metal nanoparticles applied in pollutant detection
- Carbon Captures: Gas Hydrates, Carbon dioxide removal
- Environmental Remediation: Green nanomaterials for Pollutants adsorption / photodegradation
- Natural Products from Antarctic Bacteria: Bioactive compounds, Natural pigments, Biomaterials from wastes



Physical Chemistry

- Development of innovative materials for electrochemical storage: a) anodes, cathodes and solid-state electrolytes for Li-ion and Na-ion batteries and supercapacitors based on sustainable materials and processes; b) binders for sustainable and eco-friendly electrode processing
- Second life of Li-ion batteries: a) diagnostic methods for the State-of-Health; b) sustainable recycling methodologies of cells, electrodes and materials
- Fuel cells: Low-PGM or PGM-free materials for PEM fuel cells



Impacts

SNSI thematic areas 5.4.2-5.5.4: Smart and sustainable industry, energy and environment: Critical Raw materials, Innovative Processes

PNR/Horizon Europe research areas: Area **5** Climate, Energy, Sustainable Mobility

UN Sustainable Development Goals: **6** Clean Water and Desalination; **7** Affordable and Clean Energy; **12** Responsible Production and Consumption; **13** Climate Action

Relationships with companies: FAAM, MIDAC, LOCCIONI, MIRKA, CHIMEC, FINTEL, KAIROSPACE, ECOTECH, LABORATORIO DEL MARE

Projects: PRIN – EU-LIFE – ETN Doctoral Networks

International collaborations: Newcastle University (UK), University of South Bohemia (Czech Republic) Xinjiang University (China), Warwick Manufacturing Group (Coventry, UK), ZSW (Ulm, Germany), HIU (Ulm, Germany)