Green Approaches for the Organic Synthesis
Various Collaborations

Scientific goals
Synthesis of intermediates and organic compounds having practical application, using H₂O as the solvent. The use of surfactants, possibly “green”, is an important innovation in organic chemistry.

Context
The future of chemistry requires to modify completely the synthetic approach for organic compounds, reducing the environmental impact. In the last three years complex reactions were successfully performed in water.

Methods
Synthesis of surfactants and their application to the synthesis in water of organic compounds. Structural characterization through UV, IR, NMR, Mass spectrometry. Application of Experimental Design.

Reactions
Aldol, Michael, Knoevenagel, Krophke, Suzuki-Miyaura, Sonogashira

Targets: compounds and materials for photovoltaic systems

References
Quagliotto, P. et al., Dyes and Pigments 2017, 137, 468-479.

From Materials to Devices: a way towards energy conversion and storage
in Collaboration with POLITO (possible stages abroad)

Water DSC Solar Cells
• Novel Dyes Development
• Novel Electrolytes: polymers and biopolymers
• Experimental Design
• Applied Electrochemistry

New Systems for Energy Storage (batteries)
• Electrodes Material Development through agrochemical waste conversion
• Polymeric and biopolymeric Electrolytes
• Assembly and electrochemical testing of Li / Na-based cells from the laboratory to the industrial scale.

References
• Chem. Sci. 7 (2016) 4880
• Green. Chem., 10.1039/C6GC02625G
• Energy Tech., 10.1002/ente.201600285

Form Synthesis to Application: photocative system for “green photonics”

EMITTERS for LEC and PHOSPHORS WHLED (Sustainable Illumination)
coll. R. Costa (Madrid), Prof. Civalleri, Prof. Bonino (Chimica)
- Synthesis of ligands and organometallic systems
- Synthesis of Metal Organic Frameworks
- Physico-Chemical Characterization
- In the case of a stage abroad (Dr. R. Costa) preparation and characterization of the device
- In the case of an industrial stage: compatibilization with polymeric systems.

LEC

HYBRID DOWN SHIFTERS (Photovoltaic Systems)
coll. Prof. M. Milanesio, UNIPO and dr. A. Menozzi (SE srl)
- Synthesis of low-cost organic molecules with UV absorption and specific emission characteristics (high Stokes Shift and quantum yields)
- Use as additives in polyurethane resins (possible industrial stage)
- Physico-chemical characterization of the photocative polymer

References
• ChemSusChem 9 (2016) 1279
• Dyes Pigments 137 (2016) 162

Synthesis of intermediates and ligands for the CO₂ reduction
in collaboration with Prof. C. Nervi and Prof. Gobetto (UNITO)

Scientific goals
Synthesis of organic ligands, of their complexes and electrode functionalization. Determination of the CO₂ reduction.

Context
Re, Fe, Mn and other metal complexes with organic ligands can promote the CO₂ electrochemical reduction. The final goal is to obtain high activities and selectivities. The use of the solar energy to perform the CO₂ reduction is devoted to the Solar Fuels production.

Methods
Synthesis of intermediates, ligands and organometallic complexes. Structural characterization through UV, IR, NMR, Mass spectrometry. Electrochemical functionalization of the electrodes, Trials of CO₂ electrochemical reduction.

References
• Quagliotto, P. et al., Dyes and Pigments 137, 2017, 468-479.