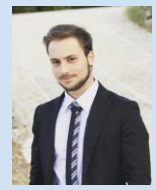
Electrochemical reforming of Biomass in order to obtain H_2 and value added products



Roberto Licatese
roberto.licatese@unipa.it

Electrocatalysis

Concept:

Electrochemical reforming of biomass is emerging as a pivotal argument in discussions regarding its potential benefits for the sustainable production of green hydrogen (H_2), a crucial element in transitioning towards cleaner energy sources. The inherent advantage of utilizing biomass lies in the fact that the thermodynamic energy required for its oxidation is comparably lower than that needed for the Oxygen Evolution Reaction (OER). This significant disparity in energy consumption underscores the efficiency and viability of biomass-derived processes in H_2 production. Notably, oxygen, a byproduct of conventional water electrolysis, lacks high economic value, rendering the process inefficient as a substantial portion of energy expenditure is allocated to the generation of a non-valuable commodity. Within the realm of biomass, various compounds exhibit potential for yielding value-added oxidation products through electrochemical oxidation processes, with alcohols representing just one example of such compounds ripe for exploration in this context. By harnessing the electrochemical properties inherent in biomass-derived compounds, particularly alcohols, the production of hydrogen can be optimized, facilitating its integration into the mainstream energy landscape while concurrently valorizing biomass resources.

Scientific approach:

In order to chose an electrocatalyst, it's important to understand how and from what its performance is influenced. For every different catalyst, multicyclovoltammetries and Potentiostatic experiments were performed and the product of oxidation were analyzed via different analytical methods (HPLC, FTIR, MS, NMR) in order to understand the selectivity of the process.
The electroreforming was performed using different set-up, like a simple batch cell or a fuel cell.

Research objectives:

The objective of the research is to investigate novel electrochemical catalysts for the oxidation of biomass, with a focus on enhancing the selectivity of the desired products and the process efficiency, towards enabling sustainable green energy production.