A chemical and engineering analysis of the conversion of biomass to lactic acid using POMs under nitrogen atmosphere

Elisabeth Hundt [1], Jan-Dominik Krueger [1], Andreas Pawlig [1], Leon Schidowski [1], Ira Wirth [1], Maximilian J. Poller [1], Dorothea Voß [1], Jakob Albert [1]
[1] Institute of Technical and Macromolecular Chemistry, University of Hamburg, Hamburg/Germany

Abstract

The rising growth of the world's population is leading to a greater need to utilise waste and to use sustainable processes. These processes serve to meet the increasing demand for platform chemicals such as lactic acid or formic acid, which are required to manufacture a wide range of products.
The BioValCat (Enhanced Biomass Valorisation by Engineering of Polyoxometalate Catalysts) project investigates the conversion of biomass by selective homogeneous catalysis into various platform chemicals, while avoiding the formation of unwanted by-products such as humins or carbon dioxide (Figure 1). Part of this project is the selective production of lactic acid under anaerobic conditions.

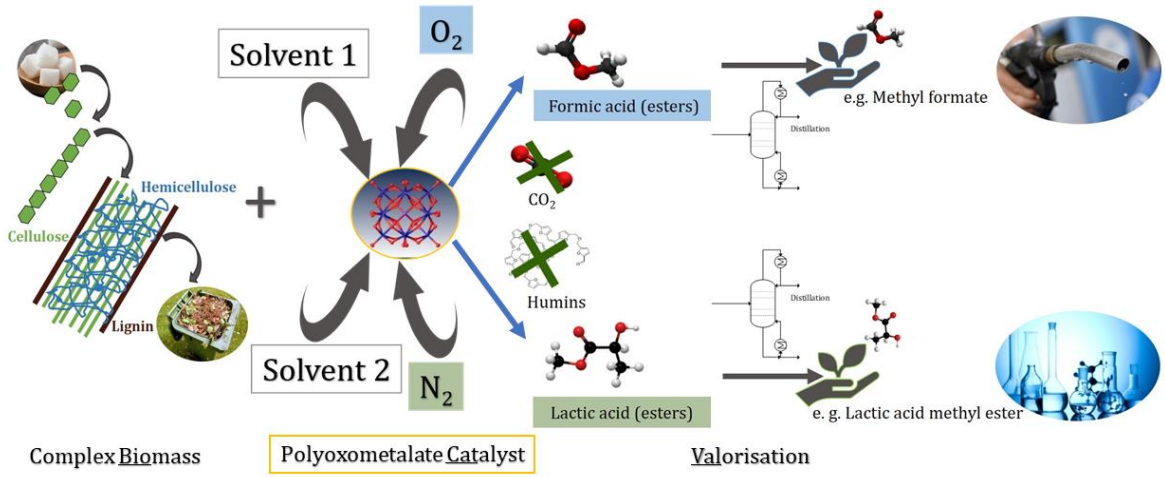

Figure 1: Conversion of different biomass to platform chemicals.

To this end, biomass is converted to lactic acid under anaerobic reaction conditions by polyoxometalate catalysts. Polyoxometalates (POMs), which are anionic molecular clusters of transition metals and oxo-ligands, are used as homogeneous catalysts. These POM catalysts are characterised by their high Brønsted acidity and redox activity. The process efficiency can be influenced by various reaction parameters like gas atmosphere, temperature, solvent or type of POM catalyst.
Our aim is to gain a deeper understanding of the influences of these factors on the reaction performance, such as humins.