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## **Enzymatic Modifications of Carbohydrates in Ionic Liquids**

Ionic liquids are capable of dissolving cellulose and different forms of lignocellulosic biomass, even wood. Dissolution of biomass opens up new routes for fractionation and homogeneous modification of biomass components, most notably cellulose. Many homogeneous chemical modifications on cellulose have been described in ionic liquid solutions, whereas enzymatic transformations in the said conditions are sparingly encountered in the literature.

The aim of the PhD research project is to gain a deeper understanding of the phenomena affecting the enzymatic action in the presence of ionic liquids. Ionic liquids influence in both enzymatic activity and the substrate structure. Of particular interest in this project are the enzymatic hydrolysis of biomass catalyzed by hydrolases, esterification reactions with lipases, enzymatic construction of glycosidic linkages with glycoside transferases and oxidation of carbohydrates.

This research field is new. Thus, it has been necessary to develop new analytical methods for analyzing sugars in hydrolysates in the presence of ionic liquids, new experimental setups and so on. The work has so far been concentrated on hydrolysis reactions of model substrates. As expected, the presence of ionic liquids seriously deactivates non-stabilized enzymes and it is necessary to develop methods for gaining a better enzyme activity. This may be achieved by tuning the properties of the ionic liquid solutions, immobilizing enzymes, or finding enzymes particularly stable in high ionic strengths.

The research is of interest in the breakdown of lignocellulosic biomass, in order to produce chemicals and bioethanol, as well as in material sciences, in making new products out of cellulose by enzymatic esterification and oxidation.