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Ionic liquid pretreatment of lignocellulosic agricultural waste

Ionic liquids have very peculiar properties compared to conventional organic solvents. Ionic liquids can dissolve cellulose and other weakly soluble or insoluble biomaterials such as lignin and wood. Ionic liquids are not volatile and have very high thermal stability compared to conventional organic solvents. Ionic liquids have some toxicity, however, ionic liquids are considered less toxic alternative, thus they can be considered as “green” solvents.

Sometimes waste can be excellent starting material for another application. Lignocellulosic biomasses such as agricultural waste or wood can be utilized to manufacture higher value biomaterials e.g. biofuel or other valuable chemicals or materials. Agricultural waste such as corn stalk, bagasse and various kind of straws are lignocellulosic waste materials which consists of the same main components as wood and can be fractioned to cellulose, hemicellulose and lignin. Lignocellulosic waste materials are interesting starting materials because they are renewable and very cheap.

There are countless number of possible cation-anion pairs that form an ionic liquid. Even the slightest change in the chemical structure of the compound will have influence on the properties of the ionic liquid. By chemically modifying the organic cation properties can be tuned. With the tuning one can alter some of the properties such as viscosity, melting point and solvation properties. Also the selection of anion will have great influence on the properties of the ionic liquid. Anion plays an important role for example in solvation properties and thermostability.

Recycling ionic liquids can be cumbersome task due the accumulation of non-precipitating material. When processing biomasses if carbohydrates or lignin are cleaved, fragmented or converted to smaller molecular weight species the result can be a complex mixture of compounds. Often the smaller molecular weight species tend to accumulate in the ionic liquid which may lead to uneconomical separation procedure or ionic liquid waste. One of the goals in the research is to develop an efficient separation method in order to have a high performance recycling system for ionic liquids.