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Hydrothermal liquefaction of amino acids as model compounds of protein rich biomass

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Due to the public criticisms against the use of food crops for biofuel production, there is a great interest in converting advanced biomass (e.g., lignocellulosic and organic waste, algae) into biofuels. Hydrothermal liquefaction (HTL) is one of the promising technologies, since the bio-oil derived from HTL has lower oxygen content, higher stability and heating value. However, due to the presence of proteins in biomass, their degradation products are responsible for high nitrogen content in the bio-oil. Nitrogen containing compounds are highly problematic for conventional hydtrotreatment catalysts, since they strongly adsorb to active sites of catalysts during upgrading, thus resulting in inhibition of deoxygenation reactions. In addition, these compounds cause the harmful NOx emissions. Therefore, it is essential to determine the reaction pathway of nitrogen containing compounds in order to minimize their formation and improve the performance of HTL. Doubtless, it can be very challenging to understand the chemistry of HTL, if starting directly from complex biomass. In this connection, in current study the amino acids were employed as model compounds in order to investigate the degradation route and the repartition of nitrogen during hydrothermal liquefaction. The effect of different catalysts and solvents on nitrogen distribution into products of hydrothermal liquefaction of amino acids was investigated. The use of catalysts and co-solvents in the liquefaction process were expected to decrease the nitrogen content. Data obtained from current study can provide deeper understanding the reaction pathways and mechanisms of nitrogen containing compounds at HTL, thus allow improving the HTL performance.

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