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Biotechnology Regulation: New Challenges for Blue Economy ☐

MICROALGAE VALORIZATION BY CATALYTIC ASSISTED HYDROTHERMAL LIQUEFACTION

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The growing demand for energy resources and the need to reduce the consumption of fossil fuels in favour of more sustainable processes led to an interest in the production of biofuels trough different routes, such as gasification, pyrolysis or Hydrothermal Liquefaction (HTL) of biomass. This contribution is focused on the development of fuels based on renewable resources, algae biomass (*Scenedesmus Almeriensis*), by Direct-HTL and Catalytic-Assisted-HTL (CA-HTL) as an efficient process for biomass conversion by decomposing biogenic feedstock under high pressures and temperatures conditions in the presence of water.

Algae was characterized to evaluate its capacity to be transformed into biofuel by obtaining its HHV (Higher Heating Value), elemental and proximal analysis. HTL tests were carried out at 280 °C in a Parr 4842 pressure reactor with a capacity of 600 cm^3 under subcritical water conditions and a residence time of 40 min. A biomass:water ratio of 1:2 was used for both processes and 3%wt. of glycerine and Ni-Pt/Al_2O_3 catalyst were added to the catalytic process.

Regarding biomass characterization, a HHV of 20.7 $MJ \cdot kg^{-1}$, an H/C ratio of 1.76 and an O/C ratio of 0.13 were obtained. CA-HTL converted algae into liquid fuels without the requirement of prior energy-intensive drying, including the catalytic upgrading of intermediate biocrude to final fuels. HTL produced the depolymerisation, hydrogenation, decarboxylation and decarbonylation of the biocrude improving his quality. It is noteworthy the reduction of the O/C ratio and the increase of the H/C ratio, in parallel with an improvement of the calorific value, as can be seen in Table 1, for the biocrude produced using CA-HTL. This suggests that this new strategy allows the generation of a less oxygenated and saturated biocrude in a single stage with properties closer to a conventional fuel.

Table 1. Calorific value obtained by calorimetry for the different samples analyzed.

	Algae biomass	**D-HTL biocrude**	**CA-HTL biocrude**
HHV ($MJ \cdot kg^{-1}$)	20.69	31.35	44.91

The tandem coupled reactions open new opportunities for the efficient upgrading of bio-oil-derived oxygenates to renewable fuel range.

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