Next advanced biofuels from algae biomass and organic biogenic wastes for electricity generation through fuel cells application

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Résumé

The need for sustainable alternatives to fossil fuel is getting more and more urgent as the world grapples with the challenges of climate change. Traditional biofuel production methods often fall short, relying on limited feedstock and producing significant carbon emissions. In this context, the NIAGARA project sets out to revolutionise biofuel production through innovative means. By harnessing readily available biogenic wastes like wastewaters and sewage sludge alongside the production of carbohydrate-rich microalgae, NIAGARA aims to create a sustainable process chain. An innovative combination of thermochemical processes (hydrothermal liquefaction, aqueous phase reforming, gasification and CO2 capture) converts this mix of resources into a hydrogen-rich advanced biofuel, which powers a Solid Oxide Fuel Cell generating electricity.

The process involves:

- applying an innovative continuous HTC process to convert the mix of biogenic wastes and microalgae into a solid fraction (hydrochar) and an aqueous phase.

- processing the solid outputs from HTC in gasification and the liquid outputs in aqueous phase reforming.

- extracting CO2 from the produced gas using CO2 capture with innovative sorbents.

- using the biofuel, e.g., for efficiently producing electricity with solid oxide fuel cells.

This process is designed to have a very low carbon footprint and has the potential to become carbon-negative over time with further optimization.

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