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Computer aided evaluation of large-scale bio-hydrogen production from empty palm fruit bunches

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Abstract:Nowadays, there are specific needs related to palm oil production chain that must be satisfied in order to achieve sustainability, andone of them is the valorization of residual biomass generated during palm oil production. In this sense, computer-aided simulation has been successfully used to evaluate emerging technologies of biomass processing to obtain high value products and can help to predict technical behavior of novel feedstocks that matches the sustainability criterion. In this work, a valorization of palm oil crop residues through hydrogen production using computer aided process engineering was developed based on a palm production capacity of 360,000 t/yr. Simulation took into account technological limitations and novel equipment performance, special chemical species present in bunches were modeled and process topology was built using a commercial simulation software. A sensitivity analysis was performed by changing relevant operating conditions in the hydrogen production process. Results shows that, with the biotechnological process for hydrogen it can be produced 3989.76 t/yr of hydrogen from Empty Palm Fruit Bunches without using a sulfur removal unit. In addition, it is possible the use of SelexolTM for cleaning the hydrogen and retrieve it at 10 °C and 36.2 atm, which makes unnecessary including a desorption tower.

Keywords: Residual biomass, valorization, emerging technologies, hydrogen.

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