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Oral Presentations #11

Aqueous-phase reforming for simultaneous hydrogen production and waste treatment: insights from the BIVALIA project

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Keywords: *aqueous phase reforming, bio-hydrogen, circular economy*

Biohydrogen derived from residual biomass (WBM) plays a pivotal role in the transition toward a circular economy and a sustainable energy model. Aqueous phase reforming (APR) offers a route for converting organic matter present in dilute aqueous solutions into a hydrogen-rich gas that also contains CO_2 and small amounts of light alkanes. APR operates under relatively mild conditions (200-250°C and 15-50 bar) [1], with Pt/C being the most used catalysts due to their high stability under the hydrothermal conditions typical of APR process. While APR was initially developed and studied using model compounds such as glycerol or sugar alcohols as feedstocks, recent studies have shown that its economic viability relies on the use of low-cost feedstocks [2]. Consequently, waste streams containing organic matter from diverse industries such as brewing, fish canning, or juice production have been also explored as feedstocks [3].

The APR process has been integrated into the biorefinery schemes proposed within BIVALIA project, with the aim of recovering both mass and energy from high water content waste streams generated in other stages of the BIVALIA framework. The waste streams identified as having potential for APR include aqueous fractions of bio-oil, washing streams generated during the treatment of brewery bagasse and grape stalks, and effluents from hydrothermal carbonization, steam explosion and enzymatic hydrolysis, among others. Several challenges associated with the application of APR will be assessed as part of BIVALIA work plan, including catalyst deactivation and the enhancement of some feedstocks processability by chemical pretreatment. Finally, different alternatives for the utilization of the hydrogen-rich gas stream produced will be evaluated, including its use as fuel-gas, its recycling as hydrogen source to other biorefinery processes (e.g. hydropyrolysis or phototrophic fermentation), or its export from the BIVALIA scheme as crude hydrogen product stream.

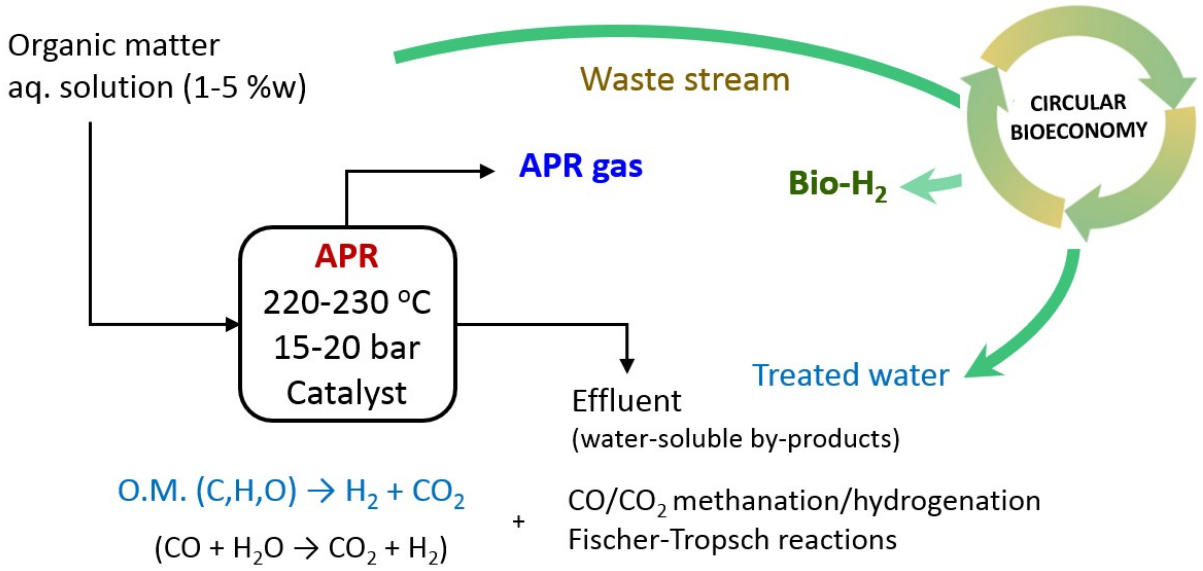


Figure 1. Fundamentals of Aqueous Phase Reforming and integration in BIVALIA-CM scheme

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