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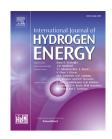
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Process simulation and techno-economic assessment of SER steam gasification for hydrogen production

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ABSTRACT

In the SER (sorption enhanced reforming) gasification process a nitrogen-free, high calorific product gas can be produced. In addition, due to low gasification temperatures of 600 $-750\,^{\circ}\text{C}$ and the use of limestone as bed material, in-situ CO₂ capture is possible, leading to a hydrogen-rich and carbon-lean product gas. In this paper, results from a bubbling fluidised bed gasification model are compared to results of process demonstration tests in a 200 kW_{th} pilot plant.

Based upon that, a concept for the hydrogen production via biomass SER gasification is studied in terms of efficiency and feasibility. Capital and operational expenditures as well as hydrogen production costs are calculated in a techno-economic assessment study. Furthermore, market framework conditions are discussed under which an economic hydrogen production via SER gasification is possible.

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Introduction

Ambitious targets for reducing the release of greenhouse gases, as defined in different global emission treaties such as the Kyoto Protocol and the Paris Agreement [1,2], require an extensive reduction of greenhouse gas (GHG) emissions globally. While the share of CO₂ free electrical energy (by

increasing the share or renewable energy or by introducing CCS & CCU technologies) is increasing, the share of renewable energy in other energy intensive applications such as transport, heating or chemical industry is still low [3].

A hydrogen based economy could be a way for reducing the CO_2 emissions from sectors other than power production since hydrogen can be used as a transport fuel (e.g. in fuel cells) and as a raw product for the chemical industry.

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