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Evaluation of biogas and syngas as energy vectors for heat and power generation using lignocellulosic biomass as raw material

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Evaluation of biogas and syngas as energy vectors for heat and power generation using lignocellulosic biomass as raw material.

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Abstract

The use of non-renewable energy sources to provide the worldwide energy needs has caused different problems such as global warming, water pollution and smog production. In this sense, lignocellulosic biomass has been postulated as a renewable energy source able to produce energy carriers that can cover this energy demand. Biogas and syngas are two energy vectors that have been suggested to generate heat and power through their use in cogeneration systems. Therefore, the aim of this review is to develop a comparison between these energy vectors considering their main features based on literature reports. In addition, a techno-economic and energy assessment of the heat and power generation using them as energy sources is performed. If lignocellulosic biomass is used as raw material, biogas is more commonly used for cogeneration purposes than syngas. However, syngas from biomass gasification has a great potential to be employed as chemical platform in the production of value-added products. Moreover, the investment costs to generate heat and power from lignocellulosic materials using the anaerobic digestion technology are higher than those from the gasification technology. As a conclusion, it was evidenced that upgraded biogas has higher potential to produce heat and power than syngas. Nevertheless, the implementation of both energy vectors into the energy market is important to cover the increasing worldwide energy demand.

Keywords: Anaerobic digestion, Biogas Power Generation, Biomass Gasification, Biomethane, Energy sources, Energy vectors, Heat generation, Lignocellulosic Energy Production, Power generation, Renewable energy, Syngas Production.

Highlights.

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