Abstract

Upscaling of catalytic CO₂ methanation into a demonstration plant

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According the Sabatier reaction CO₂ + 4H₂ → CH₄ + 2 H₂O the usage of carbon dioxide and hydrogen as source materials is for a sustainable energy storage in the form of Methane already known since long time. As the existing network of natural gas is the biggest energy store we have, it could be used by feeding the produced CH₄. However the reaction mechanism and in this context the reaction kinetics of the catalytic conversion is inadequate investigated. Hence a large-scale application seems to be hardly possible until now without the appropriate efforts.

The focus of research acts therefore in pursuance with the reaction kinetics depending of the deployed catalyst under real conditions in matters of the typical contamination SOₓ and NOₓ of the produced CO₂ by a Lignite oxyfuel power plant. The used catalyst, based on Ni and Ru, are both commercial available. Furthermore the presented investigations of the catalytic conversion as a function of the flow density, temperature and content of catalyst enable the implementation of an upscaled pilot plant. The conversion of up to 25m³/h CO₂ and H₂ with a required amount of 5kg catalyst is in work. This would be with a conversion rate of 90% equate to a stored net calorific value in form of methane of about 1000kWh per day.

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