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Investigations of the Steam Iron Process for Decentralised Renewable Hydrogen Production

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Abstract

Low temperature Fuel Cells are a promising technology in order to make emission free power generation possible. The production of the required high quality hydrogen represents a main challenge for the practical application of this technology. One option would be the electrolysis of water. However, the usage of electric power results in high operation costs. Therefore worldwide hydrogen production is based on the reforming of hydrocarbons. Due to the nature of the reforming process it is necessary to purify the produced hydrogen. While steam reforming and hydrogen purification are technically mature in industrial scale applications, there is still a potential for the improvement of decentralised systems. The cyclic reduction and oxidation of metals like iron oxides allow the production of pure hydrogen in a two-step process (Fig.1).

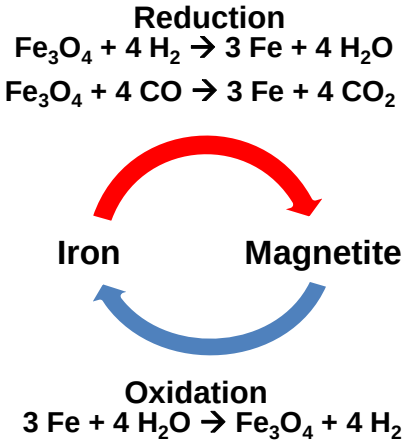

Figure 1: Cyclic redox reaction of iron and magnetite.

During the first step a synthesis gas, produced by the reforming of hydrocarbons, is used to reduce the iron oxide. In the second step the reduced species is re-oxidised with steam to produce pure hydrogen. This work is focused on biogas as feedstock for the production of the synthesis gas. The influence of different process conditions on the activity and stability of the solid as well as on the purity of the produced hydrogen is investigated.