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Hydrogen production by biogas reforming over multicomponent co-based supported catalysts

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Hydrogen is the most accredited fuel for the future, hence, several efforts are actually focused towards the development of processes and catalysts for producing hydrogen rich syngas from bio-fuels including biogas [1-2]. Biogas can be converted to synthesis gas composed of hydrogen and carbon oxide mainly by dry reforming or by a combination of dry and steam reforming using appropriate catalysts. Since the CH4 to CO2 ratio in biogas is about 1.5, dry reforming alone can lead to significant carbon deposition. Carbon deposition can be significantly inhibited by adding a small amount of steam and/or CO2 into an initial feed and optimization of operative conditions. The problem of developing highly active and stable to carbonization catalysts has not yet been solved and remains one of the most important for these processes [2-5].

In this work, the multicomponent Co-containing catalysts were synthesized and tested in dry and steam reforming of a biogas. The processes were carried out in a tubular flow reactor with using a model biogas with a ratio of CH4/CO2=1:1 under atmospheric pressure, varying gas hourly space velocity (GHSV) and temperature within 1000-3000h-1 and 300-800oC respectively. The 0.5-2 volume parts of steam have been added to a feed for providing steam reforming of biogas. To elucidate the stability of the catalysts they were continuously tested for a long-term period - 100-400 hours. The catalysts were characterised by a number of physico-chemical methods.

The synthesized catalysts perform a high stable activity in both dry and steam biogas reforming with producing hydrogen rich syngas. At 700°C, P=0.1MPa, and GHSV=1000h-1, methane conversion reaches 95.0-99.0% and syngas produced gets a ratio of H2/CO=1.2-2.7 depending on the catalyst composition and process conditions. The catalysts performed a high stable activity for all period of testing in both processes.

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