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Integrated catalytic membrane reactor process for CO_2 reforming of methane

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The greenhouse gases which are majorly **CH_4** and **CO_2** have raised concerns throughout the world due to their link to global warming and climate change. Research is ongoing to develop methods that can be applied commercially for the utilization of flue gases into useful products such as syngas. There are methods currently in use commercially such as the steam reforming and partial oxidation reforming for syngas production, but due to the requirement of very high operating temperatures, these methods are not usually economical for commercial syngas production. Recently, the use of membrane technology has drawn so much interest. In this study, a **CO_2** reforming method employing a catalytic membrane reactor process was built to study the **CO_2** reforming of methane. The membrane used was a tubular mesoporous tube consisting of γ-**Al_2O_3**, with the rhodium catalyst impregnated into its pores by the wet impregnation method. The impregnation method allows for the catalyst to be deposited into the pores on the outer surface of the membrane. A flue gas stream comprising of **CO_2-12.5%, CH_4-2.5%, CO-50ppm, N_2-80.595%, O_2-4.4%** was feed into a reactor system as soon in figure 1 under various operating conditions: temperature range **700°C-900°C** and flowrates of **0.45** and **1.50 Lmin^{-1}**. The exit stream was connected to a GCMS which was used to interpret the results. At **700°C**, no conversions were realized but at **900°C, CO_2** and **CH_4** conversions reached above 94%. Our catalytic membrane process is therefore a viable and effective technological breakthrough which converts the two most important greenhouse gases CH_4 and CO_2 into valuable syngas without the need for CO_2 pre-separation from flue gas.

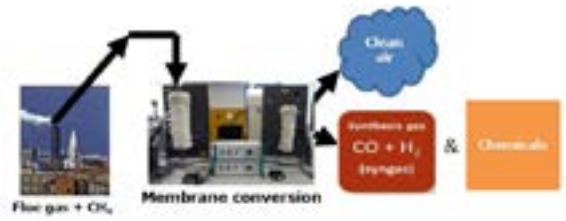

Fig.1: Catalytic membrane reactor process for the conversion of flue gas into Syngas without CO_2 separation.

Biography

Ifeyinwa Orakwe is currently undertaking her PhD programme at the Robert Gordon University, Aberdeen, United Kingdom. She is also a Research Assistant working on a project related to CO_2 reforming of methane. She has a Bachelor degree in Chemistry and Masters in Environmental Science. In her research career, she has published in professional journal papers and made oral presentations at international conferences. Her research interests are in the areas of oil and gas, waste water and designing inorganic hybrid ceramic membrane for the purpose of water treatment and syngas production.

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