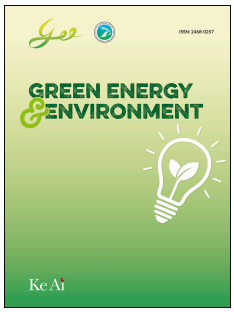
Accepted Manuscript



Integration of Multi-Stage Membrane Carbon Capture Processes to Coal-Fired Power Plants using highly permeable polymers

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PII: S2468-0257(16)30038-3

DOI: 10.1016/j.gee.2016.10.001

Reference: GEE 26

To appear in: *Green Energy and Environment*

Received Date: 16 August 2016

Revised Date: 5 October 2016

Accepted Date: 11 October 2016

Please cite this article as: M.-C. Ferrari, D. Bocciardo, S. Brandani, Integration of Multi-Stage Membrane Carbon Capture Processes to Coal-Fired Power Plants using highly permeable polymers, *Green Energy & Environment* (2016), doi: 10.1016/j.gee.2016.10.001.

Integration of Multi-Stage Membrane Carbon Capture Processes to Coal-Fired Power Plants using highly permeable polymers

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Abstract

Membrane separation systems could be a feasible option as post combustion carbon capture technologies in coal-fired power plants. Recent advancement on membrane materials based on microporous super glassy polymers could improve significantly the capture process but the properties of the materials have to guide the design of the separation stage. In this study an advanced hybrid two stage membrane process employing one of the most permeable polymer known (PIM-1) is retrofitted to a coal fired power plant and the process is analysed in terms of energy requirement and cost performance. The results are based on the use of an in-house detailed membrane module model implemented in UniSim Design®, the Honeywell process flowsheet simulator. The study indicates the need for advanced configuration in order for highly permeable membranes to be competitive with more mature technologies in terms of capture cost. The effect of ageing and impurities on the material is also investigated in order to predict the decline in process performance over time and suggest a timeproof design.

Keywords: Membranes; PIMs; Post-combustion; LCOE