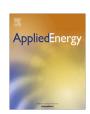


Contents lists available at ScienceDirect

Applied Energy

journal homepage: www.elsevier.com/locate/apenergy



Review

Process intensification for post-combustion CO₂ capture with chemical absorption: A critical review



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HIGHLIGHTS

- Assessment of main barriers for deploying post-combustion CO₂ capture (PCC) process.
- Evaluation of different process intensification technologies for use in PCC process.
- Rotating packed bed attracted great interest due to high mass transfer capability.
- Process flow diagram for intensified carbon capture using solvents process proposed.
- Preliminary technical and economic analysis for the intensified capture process.

ARTICLE INFO

Article history: Received 12 September 2014 Received in revised form 15 July 2015 Accepted 17 August 2015 Available online 29 August 2015

Keywords: Post-combustion CO₂ capture Chemical absorption Rotating packed bed (RPB) Process intensification (PI) Solvents Intensified heat exchanger

ABSTRACT

The concentration of CO₂ in the atmosphere is increasing rapidly. CO₂ emissions may have an impact on global climate change. Effective CO₂ emission abatement strategies such as carbon capture and storage (CCS) are required to combat this trend. Compared with pre-combustion carbon capture and oxy-fuel carbon capture approaches, post-combustion CO₂ capture (PCC) using solvent process is one of the most mature carbon capture technologies. There are two main barriers for the PCC process using solvent to be commercially deployed: (a) high capital cost; (b) high thermal efficiency penalty due to solvent regeneration. Applying process intensification (PI) technology into PCC with solvent process has the potential to significantly reduce capital costs compared with conventional technology using packed columns. This paper intends to evaluate different PI technologies for their suitability in PCC process. The study shows that rotating packed bed (RPB) absorber/stripper has attracted much interest due to its high mass transfer capability. Currently experimental studies on CO₂ capture using RPB are based on standalone absorber or stripper. Therefore a schematic process flow diagram of intensified PCC process is proposed so as to motivate other researches for possible optimal design, operation and control. To intensify heat transfer in reboiler, spinning disc technology is recommended. To replace cross heat exchanger in conventional PCC (with packed column) process, printed circuit heat exchanger will be preferred. Solvent selection for conventional PCC process has been studied extensively. However, it needs more studies for solvent selection in intensified PCC process. The authors also predicted research challenges in intensified PCC process and potential new breakthrough from different aspects.

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