

Techno-economic Analysis and Life Cycle Assessment for Four Different Solid Sorbent Processes for CO<sub>2</sub> Capture based on PEI-silica sorbent

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In this work, techno-economic analysis (TEA) and life cycle assessment (LCA) for four different adsorption based processes for CO<sub>2</sub> capture based on PEI-silica sorbent, which is 0.37EB-PEI, with sensible heat recovery were investigated. Moving bed, fluidized bed, fixed bed, and hollow fiber sorbent bed are evaluated. This work presents an initial assessment of energy efficiency and economic feasibility of this baseline configuration for an industrial-scale four different adsorption based CO<sub>2</sub> capture processes. For investigating global warming potential and additional environmental effects of the proposed adsorption based CO<sub>2</sub> capture processes, general LCA was conducted. The proposed heat-integrated adsorption based process has also significantly improved exergy efficiency. Through a rigorous economic evaluation at the system level, we investigated the levelized cost of electricity, cost of CO<sub>2</sub> captured, and cost of CO<sub>2</sub> avoided for four different processes. These values can also provide the feasibility of the adsorption processes economically compared to conventional absorption based process.