

RESEARCH PROJECT

Positions offered (2017-2018): 1 Master research project (6-9 month)

Optimization of CO₂ capture with a pressure swing adsorption prototype

Global warming caused by anthropogenic greenhouse gas (GHG) emissions is responsible for the current global climate change. The International Energy Agency (IEA) has estimated that CO₂ capture, utilization, and geological storage (CCUS) will account for as much as one-fifth of the total CO₂ reductions by 2050 [1]. As CO₂ capture account for nearly 70-85 energy consumption of the CCUS, many efforts have been focused on technology for CO₂ capture. This included absorption, adsorption and membrane separation technologies, which are the leading candidates [2]. Among all these methods, the adsorption technology has always been so much attractive for its simplicity of operation, the reusable nature of adsorbents, the relative low energy consumption and low investment cost. The reduction of CO₂ emissions from flue gases can be achieved using cyclic pressure swing adsorption (PSA) processes in a multicolumn system. In the PSA technology used for the capture of CO₂ is important to optimize cyclic sequences, the process configuration, and the adsorbent applied.

IQS is offering the possibility of carrying out an internship (that could be extended) in the framework of a Master thesis in the field of CO₂ capture. The project scope is to optimize the continuous separation of CO₂ from flue gases (15 % of CO₂) through a PSA-based process to produce a high purity CO₂ stream that can be used as a commodity in the industry. The objective of the project is to optimize the cycles of the prototype (Figure 1) that we have constructed in our lab in cooperation with the company GASN2 in order to reduce the energy consumption by CO₂ captured. Previous studies such as adsorption isotherms (Figure 2) to determine the optimal adsorbent will be carried out.

We are looking for a student of Chemical Engineering or Environmental Engineering highly motivated for lab work, adsorption processes and greenhouse gases abatement. IQS is one of the schools of engineering of the University Ramon Llull, which is located in Barcelona, one of the most wonderful cities of Spain.

References:

- Kim, Y.H *et al.* Adsorptive cyclic purification process for CO₂ mixtures captured from coal power plants. *AIChE Journal*, 2017, **63**, 1051-1063.
Li, D. *et al.* Experiment and simulation for separating CO₂/N₂ by dual-reflux pressure swing adsorption process. *Chemical Engineering Journal*, 2016, **297**, 315-324.

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Figure 1

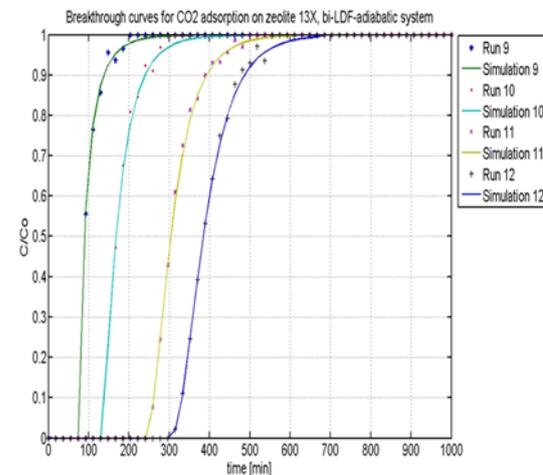


Figure 2