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Review

Simulation based improvement techniques for acid gases sweetening by chemical absorption: A review

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Abbreviations:
VLE, vapor–liquid equilibrium
FEED, front-end-engineering design
CO_2, carbon dioxide
H_2S, hydrogen sulphide
NH3, ammonia
MEA, monoethanolamine
DEA, diethanolamine
TEA, triethanolamine
MDEA, methyldiethanolamine
PZ, piperazine
QSAR, quantitative structure–activity relationships
CFD, computational fluid dynamics
AMP, amino-methyl propoanol
HETP, height equivalent to theoretical plates
SVM, support vector machine
COSMO-RS, conductor like screening model for real solvents
OPLS, optimized potentials for liquid simulations
DFT, density function theory

ABSTRACT

There are various theoretical approaches to design, improve and optimize CO_2 capture from natural gas sweetening units through chemical absorption. The aim objective of the present review is to explore various theoretical approaches developed by process and research engineers to improve the design and operation of chemical absorption sweetening units. Therefore, this review is divided into four parts. The first part discusses the basic thermodynamic and kinetic principles that represent the main core of any process simulation research. The second part is devoted to designing and improving the main columns i.e., the absorber and the stripper. The third part reviews previous research aiming at designing or optimizing the whole sweetening unit. The last part briefly discusses computational chemistry techniques used by chemists and chemical engineers to design novel solvents at the molecular level. The review ends with conclusions and a brief discussion about future perspectives to improve the process and areas that require further research effort.

Contents

1. Introduction 482
2. Thermodynamic and kinetic models 482

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