



Review

Reactive absorption in chemical process industry: A review on current activities

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HIGHLIGHTS

- ▶ A reactive absorption review covering industrial processes and research activities.
- ▶ Role of reactive absorption as a core environmental protection process and a key separation method is highlighted.
- ▶ A major application of reactive absorption is removal of CO₂, H₂S, SO_x and NO_x.
- ▶ Another major application is industrial production of basic chemicals such as nitric acid and sulphuric acid.

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ABSTRACT

Reactive absorption (RA) is a unit operation comprising the absorption of gases in liquid solutions with simultaneous chemical reactions within a single apparatus. The role of RA as a core environmental protection process has grown up significantly, and nowadays, this technology belongs to the most important separation methods in the chemical process industry, among others, for gas treatment and purification, removal of harmful substances, as well as for the production of basic chemicals, e.g. sulphuric and nitric acid.

This article provides a comprehensive review on current RA applications covering both industrial processes and research activities.

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Abbreviations: ABB, Asea Brown Boveri; AEEA, N-(2-aminoethyl)ethanolamine; amDEA, activated methyl-diethanolamine; AMP, 2-amino-2-methyl-1-propanol; B&W, Babcock and Wilcox; CCS, carbon capture and storage; DEA, diethanolamine; DEEA, N,N-diethyl ethanolamine; DETA, diethylenetriamine; DGA, diglycol amine; DIPA, diisopropanolamine; DMEA, N,N-dimethylethanolamine; DMP, N,N'-dimethylpiperazine; DTI, Department of Trade and Industry; EDTA, ethylenediaminetetraacetic acid; EEA, N-ethyl ethanolamine; EFMA, European Fertilizer Manufacturers Association; EOP, electrical output penalty; EPA, US Environmental Protection Agency; FGD, flue gas desulphurisation; HEA, high efficiency absorption; HETP, height equivalent to a theoretical plate; HTU, height of transfer units; LNG, liquefied natural gas; LPG, liquefied petroleum gas; LLB, Lurgi Lentjes Bischoff; MDEA, methyl-diethanolamine; MEA, monoethanolamine; MHI, Mitsubishi Heavy Industries; MMEA, N-methylmonoethanolamine; NTU, number of transfer units; NGCC, natural gas combined cycle; OCFE, orthogonal collocation on finite elements; PZ, piperazine; RA, reactive absorption; SCOT, Shell Claus Off-gas Treating Process; TEA, triethanolamine; TGT, tail gas treatment; TMEDA, N,N,N',N'-tetramethylethylenediamine.

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