Sensivity analysis of carbon dioxide desorption from hot potassium carbonate based on the penetration theory

A. Darvishi and M. R. Rahimpur

Department of Chemical Engineering, Shiraz University, Shiraz, P.O. Box 71345, Iran

E-mail address: Shirazhaf @ parsimail.com

Abstract

In this work, The combined effects of chemical reaction and mass transfer for desorption of carbon dioxide from promoted hot potassium carbonate solution are conventionally and adequately treated within the framework of the penetration-surface renewal theory. The penetration theory provides an appropriate desorption rate and enhancement factor for chemical desorption. The impact of parameters such promoter concentration, type of promoter and inlet temperature of rich solution on the performance of a stripper have been examined.

Key words: Hot potassium carbonate, stripper efficiency, carbon dioxide desorption, penetration, Enhancement factor

Introduction

The separation of carbon dioxide from mixtures with other gases is a process of substantial industrial importance. In the manufacture of ammonia from hydrocarbons or coal feeds, the removal of carbon dioxide from the synthesis gas is a vital process step. Large volumes of natural gas are also treated for carbon dioxide removal. Several processes are in use for CO_2 removal but process selection must be based on economic and clean-up ability. Among the processes, the amine promoted hot carbonate process provides an economic and efficient way for removing large quantities of CO_2 from synthesis gases. The applicability of potassium carbonate to CO_2 removal has been known for many years. A German patent granted as early as 1904, described a process for absorbing CO_2 in a hot solution of potassium carbonate and then stripping the solution by pressure reduction without additional heating [1].