



"Gheorghe Asachi" Technical University of Iasi, Romania



CO₂ CAPTURE BY BIOMIMETIC ADSORPTION: ENZYME MEDIATED CO₂ ABSORPTION FOR POST-COMBUSTION CARBON SEQUESTRATION AND STORAGE PROCESS

Maria Elena Russo^{1*}, Giuseppe Olivieri^{2,3}, Piero Salatino², Antonio Marzocchella²

¹Combustion Research Institute – National Research Council. P.le V. Tecchio 80, 80125 Napoli, Italy

²Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale - Università degli Studi di Napoli "Federico II". P.le V. Tecchio 80, 80125 Napoli, Italy

³Bioprocess Engineering, Wageningen University, PO Box 8129, 6700EV, Wageningen, The Netherlands

Abstract

The huge emission of greenhouse gases from fossil-fuelled power plants is emphasizing the need for efficient Carbon Capture and Storage (CCS) technologies. The biomimetic CO₂ absorption in aqueous solutions has been recently investigated as a promising innovative alternative for post-combustion CCS. The carbonic anhydrase (CA) - a broad group of ubiquitous enzymes - may catalyse the CO₂ hydration reaction and then to promote CO₂ absorption rate into aqueous solutions. Nevertheless the research on this issue is quite active, the reliable designing of absorption units still requires more details. The present study proposes the design of a random packing absorption column operated with alkaline solvents supplied with CA. The height of the packed bed to fulfil the 80% of CO₂ abatement from a flue gas stream was as large as 15-20 m. A comprehensive discussion of effects of operating conditions and of CA features on unit performance is reported.

Key words: absorption, carbon capture, carbonic anhydrase, unit design

Received: March 2013; *Revised final:* July, 2013; *Accepted:* July 2013

* Author to whom all correspondence should be addressed: E-mail: m.russo@irc.cnr.it; Phone: +39 0817682238; Fax: +39 0815936936