International Journal of Greenhouse Gas Control 61 (2017) 27–48

Contents lists available at ScienceDirect

International Journal of Greenhouse Gas Control

journal homepage: www.elsevier.com/locate/ijggc

Review

A review of potential amine solvents for CO_2 absorption process: Absorption capacity, cyclic capacity and pKa

Ida M. Bernhardsen, Hanna K. Knuutila*

Department of Chemical Engineering, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway

ARTICLE INFO

Article history:
Received 15 August 2016
Received in revised form 8 February 2017
Accepted 21 March 2017
Available online 6 April 2017

Keywords:
Review
CO_2 absorption
Amine solvents
Absorption capacity
Cyclic capacity
pKa

ABSTRACT

Solvent selection is an important element to enable low energy requirement in post combustion CO_2 capture process by means of chemical absorption. In this paper, we investigated the CO_2 capture performance of 132 different aqueous amine solvents available in the literature. The properties studied were absorption capacity, cyclic capacity and the pKa – absorption capacity relationship. In addition, fast solvent screening was critically evaluated.

Based on published data, no single amine showed superior performance in terms of absorption capacity and cyclic capacity. However, most of the studied amine solvents showed a better performance than MEA. In some cases, amines studied using the different screening techniques showed results which contradicted with the equilibrium value; the screening work seemed to lead to results where the equilibrium value was exceeded. Further, it was indicated that a solvent with promising cyclic capacity with desorption at 70 °C or 80 °C, not necessarily show the same potential with desorption at 120 °C. Thus, the value of the screening experiments can be questioned. At last, it was found a linear relationship between the pKa value of an amine solvent and its absorption capacity.

Contents

* Corresponding author.
E-mail address: hanna.knuutila@ntnu.no (H.K. Knuutila).

http://dx.doi.org/10.1016/j.ijggc.2017.03.021
1750-5836/