T8-006

KINETICS OF CO_2 ABSORPTION INTO AQUEOUS SOLUTIONS IN CO_2 CAPTURE

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T8.4. Energy and Sustainability: Capture, Storage and use of CO2

Introduction

This research has been performed to emphasize about the problem known as "climate changes" occurring due to the greenhouse gases emissions (Carbon dioxide (CO_2), Methane (CH_4),Nitrogen oxides (NO_x), Ozone (O_3), Chlorofluorocarbons (artificial). Specially, the project will be focused on the CO_2 emissions produced mainly from the fossil fuels burning in power plants and other kind of industrial processes.

To understand how important the global is warming and therefore the climate change, both the increase of emissions and the evolution of those will be studied in this project drawing conclusions about its effect.

The Kyoto Protocol, the most important agreement internationally, signed by a great majority of the industrialized and developed countries, which try to limit the CO_2 emissions to the atmosphere, will be cited in this project.

Taking into account the effects of global warming and applying the international legislation on emissions of greenhouse gases, a number of measures will be exposed, where the CO_2 capture will be studied deeply. Three different kind of CO_2 capture technologies will be studied, drawing the conclusion that the post-combustion capture, in particular by amine chemical absorption, is the most efficient one.

Experimental

In the experimental part of these project, the amine will be absorb the CO_2 in a wetted wall column where a film of liquid cascades down the inside surface of a tube, simulating the action of a cooling tower or absorption column, measuring the flow changes before and after the absorption with three flow meters and collecting the data in a computer.

Results and Discussion

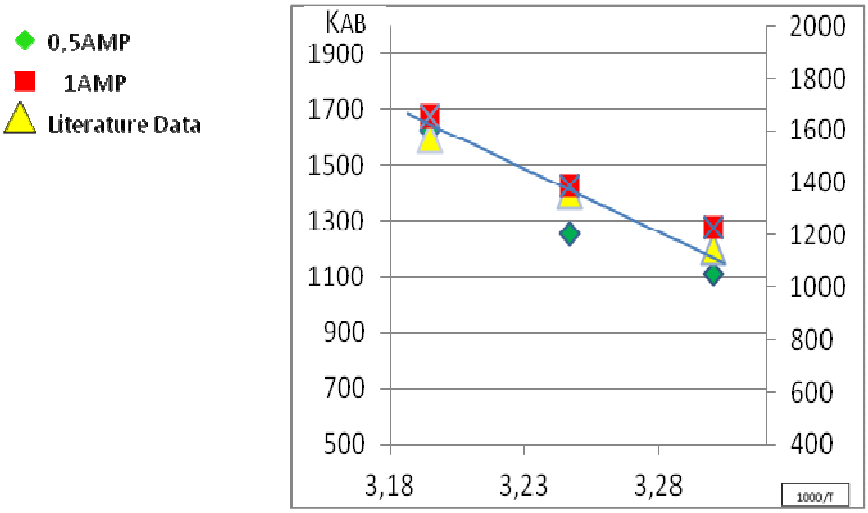
The experiment has been done with two different kind of solution:

1. The first one is an AMP aqueous solution using two different concentrations (0,5M and 1M).
2. The second one is a MEA+AMP mix aqueous solution using also different concentration.

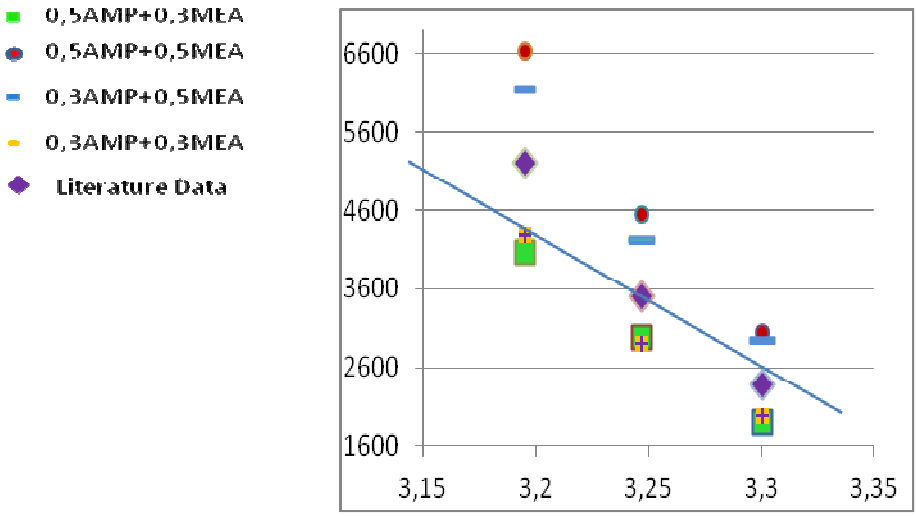
The results of both solutions are compared in this project:

1) At 303k, the intrinsic reaction constant (K_{AB}) is around 1200 $m^3Kmol^{-1}s^{-1}$
At 308k, the intrinsic reaction constant (K_{AB}) is around 1400 $m^3Kmol^{-1}s^{-1}$
At 313k, the intrinsic reaction constant (K_{AB}) is around 1600 $m^3Kmol^{-1}s^{-1}$

ISBN: 978-84-695-3536-3



2) At 303k, the overall reaction constant (Kov) is around 2375 s-1
At 308k, the overall reaction constant (Kov) is around 3500 s-1
At 313k, the overall reaction constant (K_{ov}) is around 5200 s^{-1}



Conclusions

Comparing the results obtained with a pure amine aqueous solution (AMP) and a mixed aqueous solution (AMP + MEA), we can affirm that the second solution will absorb faster the CO_2 than the first solution because it intrinsic reaction constant is higher than in the first one at the same temperature. Besides, the second solution contains two different amines which are capturing the CO_2 at the same time and we think that the amines accelerate each other, accelerating the process too.

References

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