

## Effects of additive agents on CO<sub>2</sub> solubility in MDEA solution

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## Effects of additive agents on CO<sub>2</sub> solubility in MDEA solution.

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### Abstract

Foaming is one of the major operating problems in gas sweetening. Feed gas contaminants and degradation of the amine solution are the two main reasons for foaming. The latter can be prevented by altering design and/or operational conditions; if not injection of anti-foaming agents is used as a last resource measure. These agents are used in both batch and continuous modes and due to their accumulation in the amine solution; they may cause side-effect problems. This work aims to study the effects of these additives on the solubility of CO<sub>2</sub> in aqueous amine solutions.

Two experimental facilities have been used for the sake of experimental completeness. The first one, a high pressure facility which is called "Titanium Equilibrium Cell" follows a static analytic method using a gas chromatograph. The temperatures ranges from 273 K to 473 K and pressures up to 20 MPa can be used. The second one, a "Cailletet apparatus", is a static synthetic facility which can be operated at pressure up to 15 MPa and temperatures between 275 K and 370 K.

The effect of two anti-foaming agents and one anti-corrosive agent have been analyzed. Several samples without and with additive have been prepared.

The results show that as CO<sub>2</sub> starts dissolving in the liquid solution, a second gel-like liquid phase appears, meaning that CO<sub>2</sub> enhances the phase split between the aqueous solution and the anti-foaming agent. Hence, CO<sub>2</sub> behaves as an anti-solvent. Analyzing the solubility data, it was found that the addition of any of the anti-foaming agents has a slight negative impact on the solubility of CO<sub>2</sub>. The solubility of CO<sub>2</sub> in the solution seems to be higher in the presence of the anti-corrosive agent.

In conclusion, the effects the additives have on the solubility of CO<sub>2</sub> in the aqueous amine solution have been demonstrated.