

Modified Isothermal Phase Equilibria Apparatus for Solubility Measurements of Carbon Dioxide in Aqueous Amine Solutions

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Carbon dioxide is the main greenhouse gases (GHG), responsible for around 70% of the enhanced greenhouse effect and global warming. Many solutions are focused on removing carbon dioxide from exhaust gases. Post-combustion CO₂ capture technology is the most mature solution which is based on absorption using chemical absorbents. Absorption with amine-based solvents has been extensively studied and regarded as the most effective technology for CO₂ mitigation. Accurate knowledge of thermodynamic properties of solvents, in wide ranges of pressures and temperatures, is essential for rational design and optimization of CO₂ capture units.

In the present work, a modified total pressure cell previously used to measure isothermal vapor-liquid equilibria, was arranged to measure solubility of gases in liquids [1]. The technique was checked by determining solubility of CO₂ in aqueous solution of monoethanolamine (MEA 30%w). Solubility was measured at two temperatures (313.15 K and 353.15 K) in a pressure range up to 6 MPa, calculating the carbon dioxide loading index (mol CO₂/mol MEA) which ranges from 0.4 to 0.8. Our experimental data were compared with the literature available, obtaining a good agreement. Additionally, the experimental data at both temperatures were correlated using the Xu and Rochelle's equation where carbon dioxide partial pressure is obtained as a function of loading index and temperature.

Acknowledgements: This work was funded by the Regional Government of Castilla y León and the European Regional Development Fund (ERDF) through the Project VA280P18.

References

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