Isobaric Heat Capacities of Aqueous Solutions of MDEA and DEA at High Pressures for Carbon Capture

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Low carbon economy challenge implies changing our energy systems to be more efficient and cleaner. This transition also includes the decrease of carbon dioxide emissions in order to reduce their negative effect in climate change. Therefore, it is critical to develop technologies to mitigate this problem. The use of renewable gases such as biogas accompanied with carbon dioxide removal can be contributed to reach the target of a sustainable development.

Chemical absorption using aqueous amine solutions is the most established technique to separate CO_2 in flue gases. The design of the separation units requires the accurate knowledge of thermodynamic properties such as heat capacities which are scarce in the literature being nearly inexistent at high pressures.

In the present work, isobaric heat capacities of aqueous solutions of methyldiethanolamine (MDEA) and diethanolamine (DEA), at amine mass fractions w_{amine} = 0.2 and 0.3, are reported at (313.15, 333.15 and 353.15) K and pressures up to 25 MPa. An automated flow calorimeter, developed in our laboratory [1], has been used for these measurements. Previously, the technique was checked measuring water obtaining a relative standard uncertainty of 1% for heat capacity determination. Finally, the experimental data are correlated using an empirical equation obtaining standard deviations below the measurement uncertainties. The behavior of both amine solutions is compared and discussed.

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References

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