

Solubility of Nitrous Oxide in Aqueous Solutions of Methyldiethanolamine

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Methyldiethanolamine (MDEA) is widely used for the removal of the acid gases, H₂S and CO₂ from gas streams. MDEA is a tertiary amine and has the advantage of being more selective for H₂S removal compared to conventional amines such as monoethanolamine (MEA) and diethanolamine (DEA). One disadvantage of MDEA is its higher cost compared to conventional amines. When used in gas treating, MDEA is normally employed as an aqueous solution with a mass fraction of between 30 and 50 %. The design of suitable gas-liquid contactors requires the physical solubility of CO₂. However, this solubility is difficult to determine from direct experimental measurements because the gas undergoes a chemical reaction with the solvent. Often, the physical solubility of CO₂ is determined from the solubility of Nitrous Oxide (N₂O) via the N₂O analogy. In the present work, new data will be presented which can be used to verify the N₂O analogy at high temperatures. The solubility of N₂O in two aqueous MDEA solutions (mass fraction 20% and 40%) was measured at a number of temperatures in the range of 298 K to 423 K at pressures up to 2 MPa. The new experimental data paper is a part of an ongoing project to provide experimental data useful for the design of plants for the hydrocarbon-processing industry. Previous studies included the solubility of hydrogen sulfide, carbon dioxide, methane, ethane, propane, n-butane, methanethiol, ethanethiol, and propylene in aqueous MDEA solutions. Salting-in ratios, Henry's law constants, and Setchenow coefficients have been obtained from the results and will be compared with previously reported results in the literature.