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Thermo-Physical Properties and Solubility of CO2 in Piperazine Activated Aqueous Solutions of β-Alanine

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Abstract : Carbon dioxide is one of the major greenhouse gas (GHG) contributors. It is an obligation of the industry to reduce the amount of carbon dioxide emission to the acceptable limits. Tremendous research and studies are reported in the past and still the quest to find the suitable and economical solution of this problem needed to be explored in order to develop the most plausible absorber for carbon dioxide removal. Amino acids are reported by the researchers as a potential solvent for absorption of carbon dioxide to replace alkanolamines due to its ability to resist oxidative degradation, low volatility due to its ionic structure and higher surface tension. In addition, the introduction of promoter-like piperazine to amino acid helps to further enhance the solubility. In this work, the effect of piperazine on thermophysical properties and solubility of β-Alanine aqueous solutions were studied for various concentrations. The measured physicochemical properties data was correlated as a function of temperature using least-squares method and the correlation parameters are reported together with it respective standard deviations. The effect of activator piperazine on the CO2 loading performance of selected amino acid under high-pressure conditions (1bar to 10bar) at temperature range of (30 to 60)oC was also studied. Solubility of CO2 decreases with increasing temperature and increases with increasing pressure. Quadratic representation of solubility using Response Surface Methodology (RSM) shows that the most important parameter to optimize solubility is system pressure. The addition of promoter increases the solubility effect of the solvent.

Keywords : amino acids, co2, global warming, solubility
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