

Ionic Liquids for Carbon Dioxide capture: Absorbent Selection

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Abstract:

Carbon dioxide (CO₂) is one of the major contributors to the greenhouse effect. The power and industrial sectors combined account for about 60% of the global CO₂ emissions [1]. CO₂ capture and storage (CCS), which involves the processes of capture, transport and long-term storage of carbon dioxide, is a technology aimed at reducing greenhouse gas emissions from burning fossil fuels during industrial and energy-related processes. However, CO₂ capture is a bottleneck where efforts have to be applied in order to develop technically and economically available processes.

Monoethanolamine (MEA) is described as a well know absorption liquid for the chemical absorption of CO₂ and its use in combination with a membrane device is being studied in the recent literature [2,3] because of the number of advantages of membrane processes [4]. However, the volatile character of MEA produces solvent losses due to their evaporation into the gas stream. Thus, the use of solvents with lower vapour pressure such as ionic liquids as absorption liquids may contribute to the performance of a zero solvent emission process. In addition, ionic liquids have been found to have higher solubility capacity of CO₂ [5].

A fundamental question in the assessment of the feasibility of applications involving ionic liquids and gases is to understand the structure-property relationship of the system ionic liquid and gas. Several research groups have already addressed the question the anion or the cation role in determining the gas solubilities [6-9]. In this work, solubilities of CO₂ in ILs reported in literature at room temperature and atmospheric pressure are studied. Because of the numerous ways of combining counter ions to form ionic liquids, this data is used in the development of a predictive method based on a group contribution for the solubility of CO₂ in ionic liquids in order to design a tailored cation/anion ionic liquid absorbent.

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