



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010



ALKANOLAMINE/IONIC LIQUID MICROEMULSIONS: ENHANCED CO₂ CAPTURE ABILITY WITH CURBED CORROSION BEHAVIOUR

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CSBE100850 - Presented at the Nanotechnologies Applied to Biosystems Engineering and the Environment Symposium

ABSTRACT Carbon dioxide capture processes from large point sources especially involved in power generation are being extensively investigated at present. The major impediment in this regard is high energy consumption and solvent loss during regeneration steps particularly in the case of chemical solvent systems. One feasible practice may be the replacement of aqueous media with stable solvents. Room-temperature ionic liquids (RTILs), with high stability and practically no volatility even at elevated temperatures, are emerging as promising candidates. Scheming microemulsions with RTILs as continuous phase bearing dispersed alkanolamine droplets may provide a potential opportunity with less CO₂ capture cost and enhanced process stability. Negligible O₂ solubility in hydrophobic RTILs will not only alleviate the corrosion problems but will also suppress the oxidative degradation being faced in aqueous amines. In our laboratory, experiments verifying maximum gas loading attainment (0.5 moles of CO₂ per mole of diethanolamine) in the microemulsion facilitated by product (carbamate) precipitation have already demonstrated the viability of the process for further exploration. The insolubility of the capture product in the continuous phase is meant to ease the chemical capture to continue at higher rates by overcoming the equilibrium limitations and will thus provide the advantage of regenerating a small volume with less energy consumption. The hydrophobicity of the continuous phase (RTIL) will help to exclude the CO₂ drying step as well. Furthermore, emulsification phenomenon may act as a tool in minimizing evaporation of the sorbent. Advantages in this novel process may also be practicable to be used at severe conditions of temperature and pressure, thus mimicking the pre-combustion capture scenario and solving the viscosity constraints as well.

Acknowledgements. Financial support from FL Canada Research Chair “*Green processes for cleaner and sustainable energy*”, funding from the Centre Québécois sur les Matériaux Fonctionnels (CQMF), and FL and MS Discovery Grants from the Natural Sciences and Engineering Research Council (NSERC) are gratefully acknowledged.

Keywords: Alkanolamine, Ionic liquid, microemulsion, flue gas, CO₂ loading, regeneration, corrosion.