Pilot scale absorption experiments with carbonic anhydrase-enhanced MDEA—Benchmarking with 30 wt% MEA - DTU Orbit (16/03/2019)

In this study the CO₂ mass transfer performance of enzyme enhanced MDEA solutions was benchmarked against the industrial standard 30 wt% MEA solution on a pilot packed column (10 m height, 0.1 m diameter). For all 64 experiments (18 for MEA and 46 for enzyme enhanced MDEA) relevant process data for process modelling such as flow rates, temperatures and inlet compositions as well as the overall mass transfer flux were measured. For 18 MEA experiments and 15 enzyme-enhanced MDEA experiments temperature profiles of the column and solvent loading profiles were obtained. In experiments with MEA the column height and the liquid to gas mass flow ratio (L/G) were altered, whereas for enzyme enhanced MDEA in addition to column height and L/G ratio, the effect of enzyme concentration, solvent loading and temperature on the capture efficiency were determined. The experiments clearly show the positive effect of the enzyme addition on CO₂ capture efficiency for the MDEA solvent which can be further increased by adding more enzyme. Enzyme enhanced solvents exhibited around 80% of the mass transfer performance of a 30 wt% MEA solvent solution.

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