

TNO-rapport

Most Promising Solvents for CO₂ capture

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Auteur(s)	Ir. S. Allaie
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Het ter inzage geven van het TNO-rapport aan direct belanghebbenden is toegestaan.

Summary

Solvent selection for CO₂ capture is a major work within WP 2.1 of the CATO project. Absorption of acid gases such as CO₂ in aqueous amine solutions - like Monoethanolamine (MEA) - from natural gas is a proven technology, however the removal of CO₂ from flue gases is not as straightforward as expected. Flue gases contain oxygen, which can cause problems such as degradation, precipitation, corrosion, foaming, etc. in the process and affect the process. Therefore a screening program for (novel) absorption solvents for CO₂ capture has been started in CATO. The screening studies include amino acids and their salt solutions, ammonia and amines. TNO and University of Twente have run several solvent test experiments, where physical properties of these solutions, CO₂ absorption rate, CO₂ absorption capacity, regeneration possibility, thermal stability and physical solubility in water were tested.

High absorption capacity is desirable, however the solution must be able to be regenerated, otherwise it is not possible to use it in an absorption desorption loop. High physical solubility of amino acids in water avoids precipitation, especially due to absorption of CO₂. Amine molecules with longer chain length between the amine and alkyl or other amine substituents have higher absorption rate and capacity. The type of substituent of the amine molecule has effect on the absorption rate and capacity. The results introduced several solvents which can be promising for CO₂ capture.

Among the tested solvents 13 are selected for further studies on CO₂ absorption/desorption and stability tests. The best ones among these solvents will be used for CO₂ capture experiments at lab and pilot scale.

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