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Evaluation of CO_2 Absorption Performance of Paracyclophane-oligoamine in Ethylene Glycol Solution

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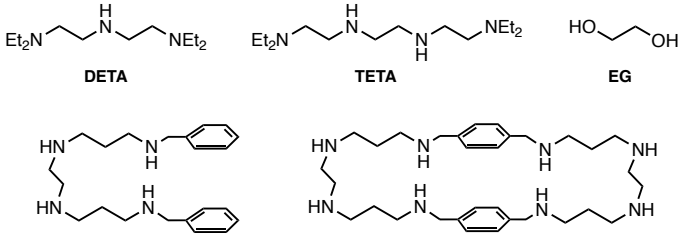
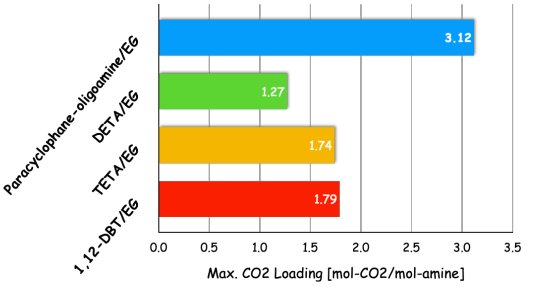
Abstract

Carbon dioxide capture and storage (CCS) is widely recognized as a key strategy for mitigating global warming in the 21st century. Our previous studies demonstrated that amine-ethylene glycol (EG) solutions exhibit excellent CO_2 absorption performance owing to EG's dual role in promoting carbonate formation and enhancing carbamate formation with these amines.[1)]
In this study, we synthesized a cyclophane-based amine **1**[2)] bearing eight secondary amine moieties in its bridging chains as a promising candidate for CO_2 capture. The CO_2 absorption and desorption properties of **1** were investigated in an EG solution under simulated flue gas conditions (13% CO_2 in N_2). As a result, approximately 80% of its amino groups participated in CO_2 chemisorption, achieving a CO_2 absorption capacity of 3.12 mol-CO_2/mol-amine. This performance significantly exceeds those of DETA (1.27 mol-CO_2/mol-amine), TETA (1.74mol-CO_2/mol-amine), and 1,12-dibenzyltetramine (1,12-DBT) (1.79 mol-CO_2 /mol-amine), thereby highlighting the superior CO_2 capture capability of paracyclophane-oligoamine **1**.





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