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Extended Abstract

Preparation and Characterization of Deep Eutectic Solvents That Can Be Used in CO_2 Absorption Processes †

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† Presented at the 16th International Symposium "Priorities of Chemistry for a Sustainable Development" PRIOCHEM, Bucharest, Romania, 28–30 October 2020.

Published: 10 November 2020

Keywords: green solvents; deep eutectic solvents; characterization; CO_2 absorption

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CO_2 emissions are well-known for creating a lot of environmental issues, at a global scale. One of the most-used technologies for CO_2 capture is the post-combustion method, which consists of separating the CO_2 from the combustion gases, using a solvent, usually amine. In this study, we propose alternative solvents: DESs (deep eutectic solvents) [1], based on choline chloride and amine, and switchable hydrophilicity DESs, based on fatty acids and diluted amine solutions. For standard DESs, choline chloride (ChCl) was used as hydrogen bond donor (HBD), and amines (monoethanolamine (MEA), diethanolamine (DEA), and triethanolamine (TEA)) as hydrogen bond acceptors (HBAs) [2,3], in different molar ratios: 1:5, 1:6, 1:8, and 1:10. All the components were precisely weighed and mixed at 300 RPM, 60 °C, until a clear solution was obtained. For switchable hydrophilicity DESs, the hydrophobic part is represented by a hydrophobic DES [4], made up of octanoic acid (OA) and other three acids, successively: dodecanoic (DA), myristic (MA), and stearic acid (SA), each in a 3:1 molar ratio. The hydrophilic phase consists of 10% amine solution [5] MEA, DEA, and TEA. The two phases were blended at 1:13 *v*/*v* oil–water, and then analyzed. The obtained solvents were in liquid state at room temperature, except for the OA–SA DES. After adding the amine solutions, the OA–SA–amine DESs were also liquid. All DESs were characterized using pH, density, viscosity, electrical conductivity, refraction index, surface tension, FTIR, and NMR. The prepared DESs are used for solubility tests to determine CO_2 absorption capacity. The hybrid DES–amines mixtures have higher absorption capacity than the ChCl-based DESs and the conventional 30% MEA—up to double CO_2 absorption capacity. Comparing the three amine types, MEA gives the best results, even in hybrid DESs. DESs represent a new green solution for CO_2 absorption. Their advantages consist of cost-effective solvent price, easy preparation, easy reuse, and regeneration. Based on the previous observations that amines and DESs can absorb CO_2, we developed combinations between them that improve the CO_2 absorption capacity and that can be tailored for controlled release in various applications.

Acknowledgements: The work on this paper was supported by the Government of Romania, Ministry of Education and Research, Project PFE 31/2018 - TRANS-CHEM, and Project 296PED/2020 - ASOCIAT, and Project 10PCCDI/2018–PRO-SPER funded by UEFISCDI. It was also funded by the UEFISCDI–Ministry of Education and Research, contract no. 51675/09.07.2019 POCU/380/6/13, A-Succes SMIS code 125125.

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