

## Documents

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**Ternary glycerol-based deep eutectic solvents: Physicochemical properties and enzymatic activity**  
(2021) *Chemical Engineering Research and Design*, 169, pp. 77-85.

**DOI:** 10.1016/j.cherd.2021.02.032

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**Abstract**

The present study investigates deep eutectic solvents (DESs) as potential media for enzymatic hydrolysis. A series of ternary ammonium and phosphonium-based DESs were prepared at different molar ratios by mixing with aqueous glycerol (85%). The physicochemical properties including surface tension, conductivity, density, and viscosity were measured at a temperature range of 298.15 K – 363.15 K. The eutectic points were highly influenced by the variation of temperature. The eutectic point of the choline chloride: glycerol: water (ratio of 1: 2.55: 2.28) and methyltriphenylphosphonium bromide: glycerol: water (ratio of 1: 4.25: 3.75) is 213.4 K and 255.8 K, respectively. The stability of the lipase enzyme isolated from porcine pancreas (PPL) and *Rhizopus niveus* (RNL) toward hydrolysis in ternary DESs medium was investigated. The PPL showed higher activity compared to the RNL in DESs. Molecular docking simulation of the selected DES with the substrate (*p*-nitrophenyl palmitate) toward PPL was also reported. It is worth noting that ternary DES systems would be viable lipase activators in hydrolysis reactions. © 2021 Institution of Chemical Engineers

**Author Keywords**

Choline chloride; Enzymatic hydrolysis; Green solvent; Ionic liquid; Molecular docking simulation; Pancreatic lipase; *Rhizopus niveus* lipase

**Index Keywords**

Chlorine compounds, Eutectics, Glycerol, Molar ratio, Palmitic acid, Physicochemical properties; Aqueous glycerols, Choline chloride, Deep eutectic solvents, Enzymatic activities, Eutectic points, Hydrolysis reaction, Molecular docking simulations, Temperature range; Enzymatic hydrolysis

**Funding details**

Universiti MalayaUMBK033-2017, GPF040A2018

This research is funded by University of Malaya RU Geran- Fakulti Program ( GPF040A2018 ) and University of Malaya Grant Bantuan Kecil Penyelidikan (BKP) grant no. BK033-2017 .

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**Publisher:** Institution of Chemical Engineers

**ISSN:** 02638762

**CODEN:** CERDE

**Language of Original Document:** English

**Abbreviated Source Title:** Chem. Eng. Res. Des.

2-s2.0-85103135143

**Document Type:** Article

**Publication Stage:** Final

**Source:** Scopus

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0167-6369