

Accepted Manuscript

Evaluation of the interaction between molecules during betaine monohydrate-organic acid deep eutectic mixture formation

Ida Zahrina, Mohammad Nasikin, Kamarza Mulia

PII: S0167-7322(16)31566-5
DOI: doi:[10.1016/j.molliq.2016.10.134](https://doi.org/10.1016/j.molliq.2016.10.134)
Reference: MOLLIQ 6538

To appear in: *Journal of Molecular Liquids*

Received date: 15 June 2016
Revised date: 29 October 2016
Accepted date: 31 October 2016



Please cite this article as: Ida Zahrina, Mohammad Nasikin, Kamarza Mulia, Evaluation of the interaction between molecules during betaine monohydrate-organic acid deep eutectic mixture formation, *Journal of Molecular Liquids* (2016), doi:[10.1016/j.molliq.2016.10.134](https://doi.org/10.1016/j.molliq.2016.10.134)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Evaluation of the interaction between molecules during betaine monohydrate-organic acid deep eutectic mixture formation

Ida Zahrina^{1,2}, Mohammad Nasikin, Kamarza Mulia^{1*}

¹Department of Chemical Engineering, Universitas Indonesia, Depok 16424, Indonesia

²Department of Chemical Engineering, University of Riau, Pekanbaru 28293, Indonesia

Abstract

Deep eutectic solvents (DES) are attractive as green media because DES are non-toxic and biodegradable. DES are obtained by mixing a quaternary ammonium salt with a hydrogen bond donor (HBD) until they form a eutectic mixture. Recently, DES have been widely applied as solvents for extraction processes. Because the solutes and HBD competitively interact with salt during the extraction process, the stability and strength of the interaction between salt and HBD molecules on DES formation should be evaluated. In this study, the interactions between molecules of the betaine monohydrate salt and different HBDs consisting of liquid organic acids (*i.e.*, propionic and acetic acid) in eutectic mixture formation were investigated by thermodynamic and spectroscopic analyses. On the basis of thermodynamic analysis, the stability and strength of the molecular interaction between betaine monohydrate and propionic acid was greater than the stability and strength of the molecular interaction between betaine monohydrate and acetic acid. The total interaction energy between the betaine monohydrate and propionic acid molecules was $-15.7 \text{ kJ.mol}^{-1}$, with an excess Gibbs free energy (G^E) of 0.81 kJ.mol^{-1} at the eutectic composition. The spectroscopic analysis indicates the presence of a weak interaction between the betaine monohydrate and acid molecules.

Keywords: betaine monohydrate, DES, molecular interaction, organic acid, stability and strength

1. Introduction

Deep eutectic solvents (DES) have attractive physicochemical properties such as a lack of volatility, thermal stability, non-flammability, high conductivity, and good solubilizing capacity for organic or inorganic compounds [1], and are thus suitable for use as green media. Likewise, DES have been applied in many applications, such as a catalyst for media reactions [2–5] and

*Corresponding author: Department of Chemical Engineering Universitas Indonesia, Depok 16424, Indonesia, Telp. (+62)-021-7863518, Fax. (+62)-021-7863515. E-mail address: kmulia@che.ui.ac.id

Download English Version:

<https://daneshyari.com/en/article/5409248>

Download Persian Version:

<https://daneshyari.com/article/5409248>

[Daneshyari.com](https://daneshyari.com)