Scientia Iranica C (2013) 20(6), 1899–1911

SCIENTIA IRANICA

Sharif University of Technology
**Scientia Iranica**
*Transactions C: Chemistry and Chemical Engineering*
www.scientiairanica.com

# Study the effect of adding co-solvent (*n*-alkoxyethanol) to sulfolane on the toluene extraction

**Khalid Farhod Chasib***

*Department of Chemical Engineering, University of Technology, Baghdad, P.O. Box 18310, Iraq.*

Received 22 April 2012; received in revised form 5 August 2012; accepted 9 March 2013

**KEYWORDS**
Liquid-liquid equilibrium;
Sulfolane;
*n*-alkoxyethanol;
Extraction;
NRTL;
UNIQUAC;
UNIFAC.

**Abstract.** Liquid-liquid equilibrium data, both binodal and tie lines are presented for the pseudo-ternary systems: (sulfolane + *n*-Alkoxyethanol) + octane + toluene at 293.15 K. The experimental liquid-liquid equilibrium data have been correlated using the nonrandom two liquid (NRTL), UNIQUAC and UNIFAC models to predict the phase composition of the systems studied here, and the binary interaction parameters of these components have been calculated. The correlated tie lines have been compared with the experimental data. The comparisons indicate that the calculation based on both NRTL and UNIQUAC models gave a good representation of the equilibrium compositions data for all systems studied. Also Othmer, Tobias and Hand methods satisfactorily correlated tie-line data of the studied systems. The agreement between the correlated and experimental results was very good. The solvent (25% sulfolane+75% 2-ethoxyethanol) shows a high capacity for toluene (a distribution coefficient around unity), and for this reason, it can be used for higher recovery of aromatics at lower solvent to feed ratios and temperatures.



## 1. Introduction

Solvent extraction is one of the most important methods to produce high-purity aromatic extracts from catalytic reformates. The selection of a solvent for extraction study depends on the solvent power measured by the solute distribution coefficient and also on its selectivity. In the case of recovery of aromatics from reformats, a solvent with largest possible capacity and highest selectivity toward aromatics is preferred.

The efficient separation of aromatic from catalytic reformates is an important concept in the chemical industry where many solvents have been tested to improve such recovery. Sometimes it may be desirable to use a low-boiling solvent that has to be distilled for a recycling process. Three major factors have been found to influence the equilibrium characteristics of solvent extraction of aromatic from catalytic reformates (i.e. the nature of solute, the concentration of solute, and the type of organic solvent). Simultaneously, the impact of additional controlling factors, such as the third-phase formation and the swing effect of a mixed solvent, can also modify the equilibrium. Process considerations dealing with the physical extraction of aromatic through hydrogen bonding or dipole-dipole interaction still remain a challenging problem, because such systems show extremely nonideal behavior.

Regarding the technical and economic merits of low boiling solvents during regeneration by distillation, the selection of Sulfolane as extracting agents from various classes of polar, protic, or nonprotic compounds was made.

In recent years, *Sulfolane* has been employed more and more in new or improved extraction processes. It is an important industrial solvent having the ability to extract aromatic hydrocarbons from petroleum products and to purify natural gas. This process is still widely used in refineries and petrochemical industry. Because sulfolane is one of the most efficient industrial

*. *Tel.: +964 790 2 89 80 18*
*E-mail address: khalid_farhod@uotechnology.edu.iq*

ELSEVIER