Surface Tension for the ternary system dimethyl carbonate + *p*-xylene+ *n*-octane from 288.15 K – 308.15 K

A. Gayol[1] , L. Casás[2], R.E. Martini[3], A.E. Andreatta[3,4] J.L. Legido[1*]

[1]*Departamento de Física Aplicada, Universidad de Vigo, Campus As Lagoas Marcosende s/n, 36310 Vigo, España.*
[2]*Laboratoire de Thermique, Energétique et Procédés (LaTEP), ENSGTI – UPPA, Rue Jules Ferry - BP 7511, 64075 Pau, France.*
[3]*IDTQ – Grupo Vinculado PLAPIQUI – CONICET – FCEFyN –Universidad Nacional de Cordoba, X5016GCA, Av. Velez Sarsfield 1611, Cordoba. Argentina.*
[4]*Universidad Tecnologica Nacional Facultad Regional San Francisco,Av. de la Universidad 501, 2400, San Francisco, Cordoba, Argentina.*
E-mail: xllegido@uvigo.es

Scientific topic: Measurement of Thermodynamic Properties. Phase Equilibria and Chemical Equilibria.

Keywords: Surface tension, ternary system, dimethyl carbonate, *p*-xylene, *n*-octane

Introduction

Dimethyl carbonates are useful in organic solvents because the chemical used as solvent extraction processes, as well as battery technology [1,2]. Molecules carbonate base, containing an aromatic and aliphatic portions have special industrial interest as gasoline additives and as lubricants in the replacement of chlorofluorocarbons (CFCs) with the new refrigerants HFC (hydrofluorocarbons) [3-6]. These industrial uses are the main reason why there has been a considerable increase in theoretical and experimental investigations of dialkyl carbonates and mixtures there of with other compounds [7-9], so our research group has also focused on the study (measurements and models) of mixtures containing carbonate molecules.

The interest in the study of this mixture lies in the fact that dimethyl carbonate [10,11] has been considered as a replacement of traditional oxygenated gasoline additive, because it is a non-toxic and environmentally friendly product capable of reducing pollutant emissions as carbon monoxide.

This work presents a study of experimental surface tension for the ternary system dimethyl carbonate + *p*-xylene +*n*-octane binary system, in the temperature range from 288.15 K to 308.15 K and at atmospheric pressure. The surface tension values were fitted by a variable degree polynomial [10-12].

Results and Discussion

The surface tension values of the ternary mixture dimethyl carbonate + *p*-xylene + *n*-octane are in the range of values between 20 mN·m^{-1} at the temperature of 308.15 K and for molar fractions rich in *n*-octane where this property take the minimun value. On the other hand the maximun is about 30 mN·m^{-1} at the temperature of 288.15 K , for molar fractions rich in dimethyl carbonate,which is the highest value of this property.

Figure 1, shows the triangular diagram for the surface tension of dimethyl carbonate + *p*-xylene + *n*-octane at 288.15 K.
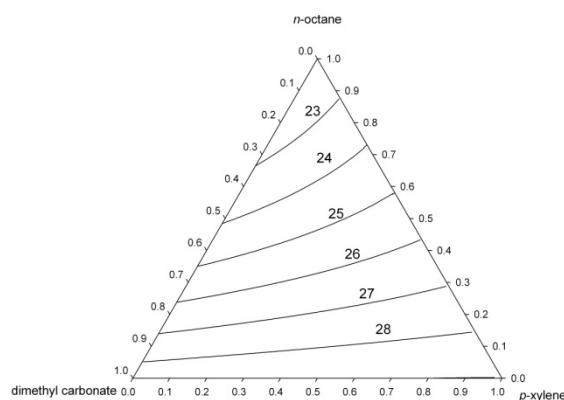
Figure 1. Surface tension of dimethyl carbonate
+ *p*-xylene + *n*-octane at T = 288.15 K.

Conclusions

The experimental surface tension in this system for both temperatures shows similar behavior. Surface tension decreases with temperature. The surface tension deviation of ternary systems are always negative.

References

[1] Tundo, P.; Perosa, A., Chem. Record. 2 (2002), 13-23.
[2] Rudnick, L.R. CRC Press, Taylor and Francis: New York, 2006.
[3] Takeno, T.; Mizui, K.; Takahatai, K. Proceedings of the International Compressor Engineering Conference at Purdue. Purdue University, W. Lafayette, IN, USA, 1992.
[4] Takahata, K.; Tanaka, m.; Hayashi, T.; Sakamoto, N., Proceedings of International Refrigeration Conference at Purdue. Purdue University, W. Lafayette, IN, USA, 1994.
[5] Hayashi, T.; Tanaka, M.; Takeuchi, K.; Takahata, K.; Sakamoto, N. Proceedings of the International Refrigeration Conference at Purdue. Purdue University, W. Lafayette, IN, USA, 1996.
[6] Spauschus, H.O. Bull. Int. Inst. Refrig. 1(1997), 2-12.
[7] López, E.R.; Mainar, A.M.; Urieta,J.S.; Fernández.J. J. Chem. Eng. Data 54 (2009), 2609–2615.
[8] Rivas, M.A.; Iglesias, T.P. J. Chem. Thermodyn. 40 (2008), 1120-1130.
[9] Pardo, J.M.; Tovar, C.A.; Troncoso, J.; Carballo, E.; Romaní, L. Thermochim. Acta 433 (2005), 128–133.
[10] Mosteiro. L.; Mariano, A.B.; Casás, L.M.; Piñeiro, M.M.; Legido, J.L., Chem. Eng. Data. 54 (2009), 1056-1062.
[11] Gayol, A.; Casás, L.M.; Martini, R.E.; Andreatta, A.E.; Legido, J.L. J. Chem. Termodyn. 58 (2013), 245-253.
[12] Gayol, A.; Casás, L.M.; Martini, R.E.; Andreatta, A.E.; Legido, J.L., J. Chem. Eng. Data. 58 (2013), 758-763.

Acknowledgments