

Accepted Manuscript

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Adel Noubigh, Manef Abderrabba

PII: S0167-7322(16)31255-7
DOI: doi: [10.1016/j.molliq.2016.07.004](https://doi.org/10.1016/j.molliq.2016.07.004)
Reference: MOLLIQ 6018

To appear in: *Journal of Molecular Liquids*

Received date: 19 May 2016
Revised date: 19 June 2016
Accepted date: 1 July 2016



Please cite this article as: Adel Noubigh, Manef Abderrabba, Solid–liquid phase equilibrium and thermodynamic properties of vanillic acid in different pure solvents, *Journal of Molecular Liquids* (2016), doi: [10.1016/j.molliq.2016.07.004](https://doi.org/10.1016/j.molliq.2016.07.004)

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Solid–liquid phase equilibrium and thermodynamic properties of vanillic acid in different pure solvents

Adel Noubigh^{1,2} and Manef Abderrabba¹

¹*Department of Chemistry, Faculty of Science, Northern Border University, Arar 91431, Kingdom of Saudi Arabia*

²*Laboratory of Physical Chemistry of Materials, Preparatory Institute for Scientific and Technical Studies of La Marsa, 2070, Carthage University, Tunisia*

ABSTRACT

Dissolution thermodynamics of vanillic acid (VA) in eight pure solvents, namely, ethanol, methanol, 2-butanol, ethylene glycol, ethyl acetate, triethyl orthoformate, 1,4 dioxane and cyclohexanone were studied. The solubility of vanillic acid in the above solvents was measured over the temperature range from (293.15 to 318.15) K at atmosphere pressure using a thermostatted reactor and UV/vis spectrophotometer analysis. It is observed that the solubility increases with the increase of temperature. All these data were regressed by van't Hoff model, the modified Apelblat equation and λh equation. The results show that three equations may well correlate the measured information. Moreover, thermodynamic studies obtained the dissolution process for vanillic acid in the selected solvents is endergonic, not spontaneous. Therefore, the experimental figures and typical parameters would provide essential support for industrial design and further theoretical studies.

Keywords: Vanillic Acid; Solubility; Organic solvents; Solid–liquid equilibrium; Modeling; Thermodynamic properties; Excess enthalpy of solution.

* Corresponding author: Tel.: +216 98 934 601; fax: + 216 71 74 65 51.

E-mail address: Adel.anoubigh@ipest.rnu.tn; anoubigh@yahoo.fr (A. Noubigh)

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