

Title: Solubility of Ethene in Water and in a Medium for the Cultivation of a Bacterial Strain

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Source: Journal of Chemical and Engineering Data

Volume: 56 **Issue:** 4 **Pages:** 1596-1601 **DOI:** 10.1021/je101248q **Published:** Apr 2011

Document Type: Article

Language: English

Abstract: The solubility of ethene in water and in the fermentation medium of Xanthobacter Py(2) was determined with a Ben-Naim-Baer type apparatus. The solubility measurements were carried out in the temperature range of (293.15 to 323.15) K and at atmospheric pressure with a precision of about +/- 0.3 %. The Ostwald coefficients, the mole fractions of the dissolved ethene, at the gas partial pressure of 101.325 kPa, and the Henry coefficients, at the water vapor pressure, were calculated using accurate thermodynamic relations. A comparison between the solubility of ethene in water and in the cultivation medium has shown that this gas is about 2.4 % more soluble in pure water. On the other hand, from the solubility temperature dependence, the Gibbs energy, enthalpy, and entropy changes for the process of transferring the solute from the gaseous phase to the liquid solutions were also determined. Moreover, the perturbed-chain statistical associating fluid theory equation of state (PC-SAFT EOS) model was used for the prediction of the solubility of ethene in water. New parameters, $k(ij)$, are proposed for this system, and it was found that using a k_y temperature-dependent PC-SAFT EOS describes more accurately the behavior solubilities of ethene in water at 101.325 kPa, improving the deviations to 1 %.

KeyWords Plus: Perturbed-Chain Saft; Liquid Water; Ionic Liquids; Gases; Eduation; State; Molecules; Pressure; Coefficients; Metabolism

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Funding:

Funding Agency	Grant Number
Fundação para a Ciência e Tecnologia	POCTI/47535/QUI/2002
MICINN-FEDER	CTQ2009-14629-C02-02
Gobierno de Aragon	Group E-52 DGA-La Caixa 2010/0341

Publisher: Amer Chemical Soc

Publisher Address: 1155 16TH ST, NW, Washington, DC 20036 USA

ISSN: 0021-9568

Citation: SERRA, Maria Celeste C.; MAINAR, Ana M.; PALAVRA, Antonio M. F. - Solubility of Ethene in Water and in a Medium for the Cultivation of a Bacterial Strain. Journal of Chemical and Engineering Data. ISSN 0021-9568. Vol. 56, n.º 4 (2011) p. 1596-1601.