

OXYGEN TRANSFER IN A GAS-LIQUID SYSTEM: KINETIC INFLUENCE OF WATER SALINITY.

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Oxygen gas is widely used as oxidant in a variety of industrial processes, such as hydrometallurgy, biochemical industry, organic syntheses, and wastewater treatment [1]. However, the gas–liquid mass transfer of oxygen usually becomes a bottleneck of the whole process due to its sparing solubility in aqueous solutions. It is therefore a research subject to enhance oxygen mass transfer. This study is dedicated to an accurate evaluation of thermodynamic and kinetics aspects in the water oxygenation process. Oxygenation can be analyzed by means of kinetic study of oxygen dissolution from the oxygen mass transfer coefficient (K_{La}) and oxygen transfer rate (SOTR) [2]. A stirred, submerged aerated 4-liters system have been designed and the operational conditions has been optimized by studying the influence of hydraulic head, air flow and salinity of water using an optical oxygen sensor. Concerning the thermodynamic phase equilibria, experimental and modelling results are obtained from different binary systems (water/air) and ternary systems (water/air/salts). This information is necessary to predict the composition of the gas phase during the process and it is also important for an implementation in a process simulation. The oxygen mass transfer coefficients were firstly measured, monitoring in the time the oxygen concentration in various synthetic liquid phases containing either salts (NaCl, KCl, LiCl and MgCl). When compared to clean water, noticeable increase of K_{La} were observed; the variation of K_{La} and SOTR with the solution salinity was modelled and found dependent on the nature of cation in the salt added. For all cases, an increase of K_{La} with salinity increasing was observed. The present study clearly confirmed the importance to define the experimental conditions before to describe and to model appropriately the gas–liquid mass transfer phenomena.

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[2] M. Lee, J. Kang, C. H. Lee, S. Haam, Park H. H., W. S. Kim, Environmental Technology 1 (22) (2001) 57-68.