

## **THE APPLICATION OF THE SUPERCRITICAL FLUID EXTRACTION IN THE REMOVAL OF POLLUTANTS FROM WASTEWATER: THE CASE OF PHENOL**

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### **ABSTRACT**

The use of Supercritical Fluid Extraction (SFE) as a separation process, for the treatment of industrial wastewater, is studied in this work. For the successful study of the process both reliable thermodynamic modeling and pilot application are necessary. The performance of the LCVM EoS/G<sup>E</sup> model in the thermodynamic modeling of the systems CO<sub>2</sub> / H<sub>2</sub>O / organic pollutant (aromatics, phenol, cresol), including the presence of cosolvent, is evaluated.

The SFE of phenol, a common pollutant, from aqueous solutions is also performed in a bench-scale extraction apparatus, using supercritical CO<sub>2</sub> at 45°C. The obtained results are satisfactory and the influence of pressure and flow rate of supercritical CO<sub>2</sub>, as well as the co-solvent effect, are examined. The LCVM model with new interaction parameters, combined with a simple mathematical one, is used successfully for the correlation of the experimental results by adjusting the overall volumetric mass transfer coefficients of the process.

Finally, the design of a unit that processes aqueous solutions of phenol with carbon dioxide, with and without cosolvent, is also examined. The use of cosolvent is a very important parameter for the process of SFE since it can cause significant decrease of the total cost of the unit. However, the application of the process appears limited due to the high equipment cost.