



University of zabol  
Graduate school  
Faculty of science  
Department of chemistry

**The Thesis Submitted for the Degree of Master of Science  
(In the field of Analytical Chemistry)**

Title:

**Comparison of the efficiency of liquid-liquid microextraction  
methods using deep eutectic solvents and switchable  
hydrophilicity solvents for measuring some pharmaceutical  
compounds**

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### **Abstract**

In this research, the effectiveness of two methods of liquid phase microextraction with an eutectic solvent and liquid phase microextraction with a solvent with variable hydrophilicity was investigated in the extraction and measurement of imipramine. In microextraction with an eutectic solvent 4-Chlorophenol and diethanolamine were used to form the eutectic solvent. Then, experimental parameters such as: solvent type, solvent volume, pH, extraction time, temperature, salt addition were optimized. The figure of merit of the method was also checked. The linear range was obtained in the range of 20-350 µg/L. Also, the repeatability of the method in one day and in 5 working days was obtained as 5.6 and 6.8, respectively. Also, the method of liquid-liquid microextraction with changeable hydrophilic solvent was studied and investigated for the extraction of imipramine. Effective factors for extraction such as solvent type, solvent volume, pH, extraction time, temperature, addition of salt were studied and evaluated and their figures of merit were calculated. In this method, the linear limit was obtained in the range of 20-350 µg/liter. Also, the repeatability of the method was obtained in one day and in 5 working days respectively 5.2 and 6.3.

**Keywords:** Pharmaceutical compounds, Gas chromatography-mass spectrometry, Liquid phase microextraction, Eutectic solvents, Switchable hydrophilicity solvents