



# LIQUID-LIQUID-SOLID EQUILIBRIA FOR TERNARY SYSTEMS WATER + LITHIUM CHLORIDE + PENTANOLS

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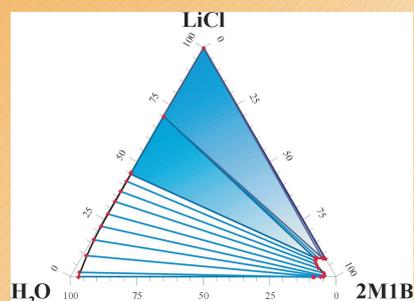
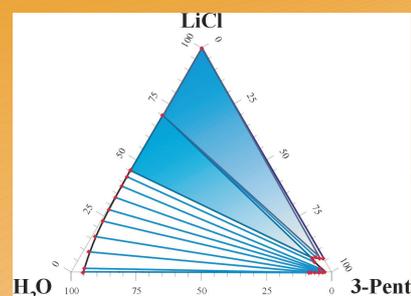
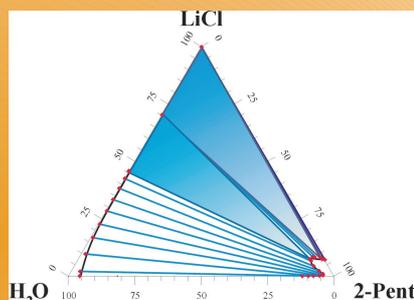
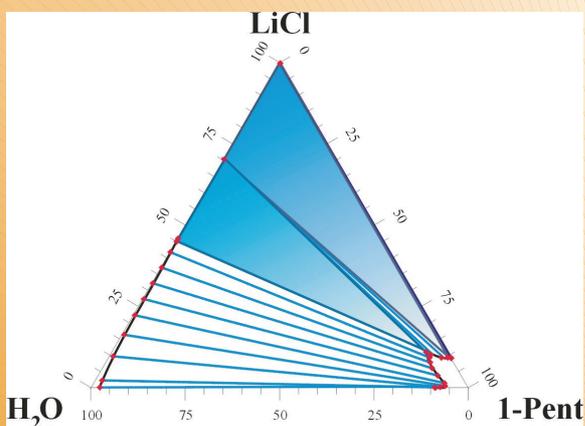
## Abstract

Liquid-liquid-solid equilibria for the ternary systems water + lithium chloride + pentanols (1-pentanol, 2-pentanol, 3-pentanol and 2-methyl-1-butanol) have been measured at 25°C.

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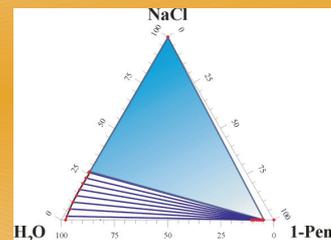
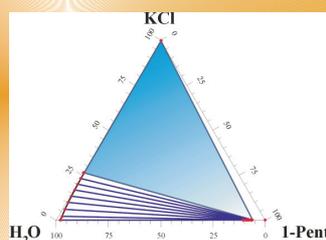
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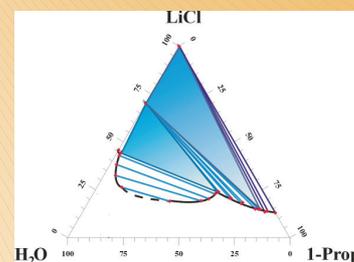
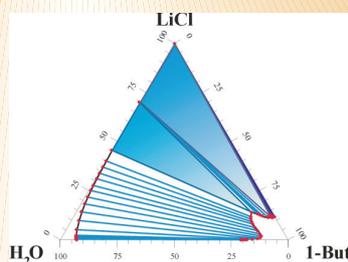
## Experimental

The procedure consisted in preparing mixtures of known overall composition by intensive mass stirring and setting several times at constant temperature to ensure that equilibrium was reached. After that, samples were taken from both phases and analysed. 1-pentanol, 2-pentanol, 3-pentanol and 2-methyl-1-butanol were determined by gas chromatography with a flame ionisation detector after mass dilution of the sample with water by a factor of 5. 1-propanol was used as the internal standard.

Water in the organic phase was determined by the Karl-Fischer method and checked by gas chromatography using a thermal conductivity detector. The concentration of salt in both phases was obtained by evaporation at 160°C of a known mass of sample. Two different techniques were used in order to determine the type of hydration present in the lithium chloride (this salt could be present as anhydrous LiCl or alternatively LiCl · H<sub>2</sub>O): 1. Calculation of water evaporated at 160 °C from certain amount of solid. 2. Determination of water content in the solid by Karl Fischer method. Prior to analysis the solid was centrifugated at 9000 r.p.m. during 15 minutes to achieve its separation from the liquid phase.



The usual effects of the addition of salt (NaCl, KCl) in a liquid-liquid system water + organic solvent are to decrease both the solubility of the solvent in the aqueous phase and the solubility of water in the organic phase.



## Results

In systems with lithium chloride as those studied in this work, the concentration of water in the organic phase drops sharply with increasing LiCl (the usual effect) but thereafter appears an unusual s-shaped solubility curve in the organic branch.

## Conclusion

This unusual behaviour appears when the concentration of salt in the organic phase grows. In this moment both water and the organic solvent take part in the solvation of ions. The greater the salt concentrations, the greater the number of ions solvated by water and organic solvent and the solubility of salt in the organic phase increases notably.