**Summary**

Difficulties associated with the phase equilibrium data correlations, such as convergence, objective function definition, initial parameters value dependence, and existence of multiple or metastable solutions, make difficult the correlation of the experimental liquid-liquid equilibrium data for some systems.

In this paper, a robust algorithm proposed by the authors, has been used to correlate 11 ternary systems that have not been previously correlated in the DEHEMA Chemistry Data Series [1] or, if they were, results were inconsistent with the number of miscible pairs in the system (Figure 1).

A good representation of the LLE data for all the systems has been achieved using the NRTL model.

**Correlation Procedure**

For the specific calculation of the LLE, the inactivity criterion has been applied using the Newton-Raphson method. In addition:

1. A procedure [2] based on the second derivative of the Gibbs energy of mixing function ($\partial^2$), that takes advantage of the topological information related to surface curvature changes, is used to eliminate most of the problems arising from multiple solution roots and the need for smart initial guesses.
3. A polynomial relation between the NRTL parameters $A_{ij}$ deduced elsewhere [4], has also been used to ensure correct phase behaviour among all the binary subsystems involved in the ternary system.

The Simplex Flexible method was used as the optimization tool for the calculation of the NRTL parameters $A_{ij}$ which minimize the composition objective function.

Moreover, in order to check the consistency of the NRTL parameters obtained, in the whole range of compositions, a stability test based on the topological analysis of the $g^{th}$ surface has been carried out (Figure 2).

**Results and Discussion**

Results for 11 ternary systems are shown in Figures 3 to 13. NRTL parameters and the calculated standard deviations for each system are provided in the table shown below.

It can be seen that, using an appropriate correlation algorithm, many problems related to phase equilibrium correlations can be overcome.

<table>
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<tr>
<th>System</th>
<th>NRTL Binary parameters: $A_{ij}$ and $G_{ij}$</th>
<th>$A_0$</th>
<th>$A_1$</th>
<th>$G_0$</th>
<th>$G_1$</th>
<th>Standard deviation</th>
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**References & Acknowledgements**