

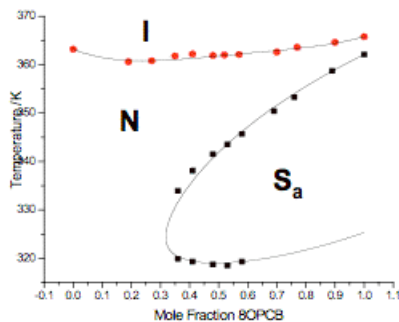
Investigation of Binary Phase Diagrams Through the Equal Gibbs Curve (EGC) Method

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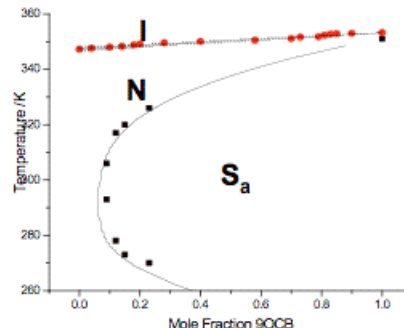
Binary mixtures of liquid crystals have been and continue to be extensively studied. Very often these studies involve the determination of a phase diagram exhibited by a pair of mesogens through DSC, and polarized light microscopy. There have been a few attempts to calculate phase diagrams using the Equal Gibbs (EG) method, but in general the collected data is not fit to any quantifiable theory. This project revolved around using the EG method to calculate phase diagrams for binary mixtures of liquid crystals.

The way in which the phase diagrams were calculated was to take the equation to the right and fit it to the collected phase diagrams by setting $\Delta G(T)=0$, this yielded close fits without having to use many parameters. Not only was this method easily capable of fitting collected data, but it was also capable of reproducing a phase diagram when given only the thermodynamic constants.

$$\Delta G(T) = x \left[-\Delta S_1(T_{H1}) * (T - T_{H1}) - \Delta a_1(T - T_{H1} - T \ln(\frac{T}{T_{H1}})) - \frac{\Delta b_1}{2}(T - T_{H1})^2 - \frac{\Delta c_1}{2}(\frac{T - T_{H1}}{T_{H1}^2 T}) \right] + (1-x) \left[-\Delta S_2(T_{H2}) * (T - T_{H2}) - \Delta a_2(T - T_{H2} - T \ln(\frac{T}{T_{H2}})) - \frac{\Delta b_2}{2}(T - T_{H2})^2 - \frac{\Delta c_2}{2}(\frac{T - T_{H2}}{T_{H2}^2 T}) \right] + \Delta G^E$$



Goodby et al. *Liquid Crystals & Ordered Fluids*, Griffin, A.C., Johnson J.F., Eds: Plenum: New York, 1984; Vol. 4, pp89-110



Cusmin, Paul et al. *J. Phys. Chem. B* 2006, 110, 26194-26203

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