

145h Understanding Binary Mixture Properties through 3d Phase Diagrams

Alejandra Alarcon-Garcia, R. Chavela-Guerra, and L.G. Rios-Casas

In many occasions, the language of Thermodynamics is very complicated and the undergraduate students can not make an obvious interpretation of the theoretical concepts. It is more effective to use physical models or schemes representing the phenomena. As an example, three dimensions (3D) diagrams give a good idea about the vapor-liquid equilibrium (VLE), before introducing abstract definitions like fugacity, fugacity coefficient and other phase equilibrium criteria. Unfortunately, there are not enough 3D diagrams available in literature. In consequence, the binary mixtures and their behavior have been traditionally studied through diagrams in two dimensions. In this work, several 3D diagrams for binary mixtures are presented showing the relation between thermophysical and thermodynamic properties. The excellent graphical capabilities of Matlab® were used to generate the PT_{xy} , PV_{xy} , PH_{xy} , TS_{xy} phase diagrams. Six binary mixtures were selected to represent the different possible behaviors. The thermodynamic model used to estimate the properties of each mixture was chosen comparing the available experimental data with the predictions obtained using Aspen Plus. This tool was also used to generate all the values needed to complete the data base to construct the graphics. Over the last year, this methodology has been applied in the Phase Equilibria and Chemical Thermodynamics courses at undergraduate level. The professor has perceived that the students show good acceptance and the evaluations have revealed a better understanding of these topics. The success of this approach relies on the proven fact that the learning experience is more effective the more senses are involved.