VLE AND VLLE DATA FOR THE SYSTEM WATER-ETHANOL-1,4-DIMETHYLBENZENE

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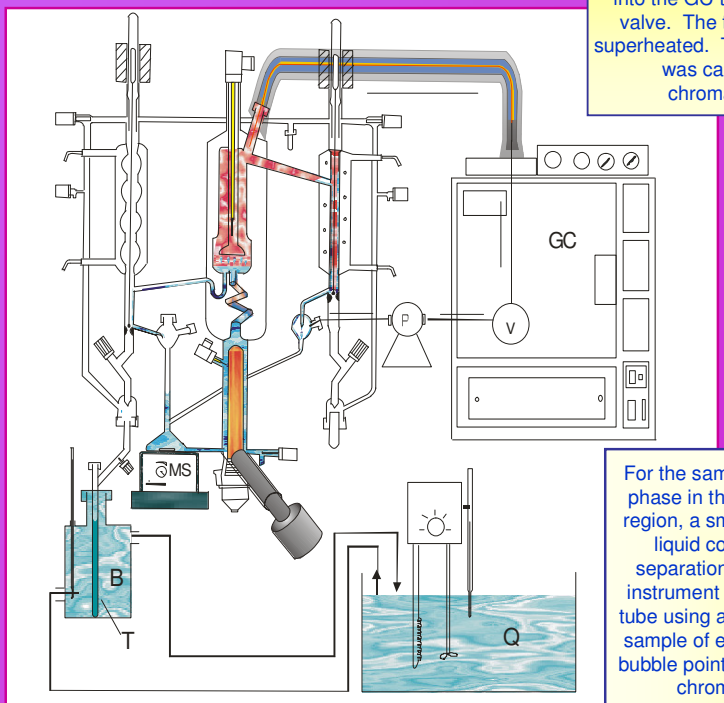
Bioethanol can be used directly as an additive to gasoline. During its manufacture, it must be dehydrated to obtain pure ethanol. Commercially, this is done by ternary azeotropic distillation. Instead of obtaining absolute ethanol, it is possible to achieve a mixture of ethanol without water plus a hydrocarbon by means of heterogeneous azeotropic distillation, utilizing less energy. The ethanol + hydrocarbon mixture thus obtained could be employed as gasoline without the need of subsequent distillation. The hydrocarbon acts as an entrainer in the heterogeneous azeotropic distillation process.

Vapour-liquid equilibrium (VLE) and vapour-liquid-liquid equilibrium (VLLE) data have been determined experimentally for the system water-ethanol-1,4-dimethylbenzene (p-xylene) at normal atmospheric pressure. These data will permit study of the viability of an azeotropic distillation process using a component of gasoline such as 1,4-dimethylbenzene as entrainer.

Equipment used for the determination of VLE and VLLE. The Labodest 602, built in Germany by Fischer Labor und Verfahrenstechnik, was modified by Gomis et al. (2000) coupling an ultrasonic homogenizer. The ultrasound system ensures a good dispersion of partly miscible liquid phases, and thus makes the set-up perfectly suited to the determination of VLLE data. For VLE determinations, the same apparatus without modifications was used.

EXPERIMENTAL

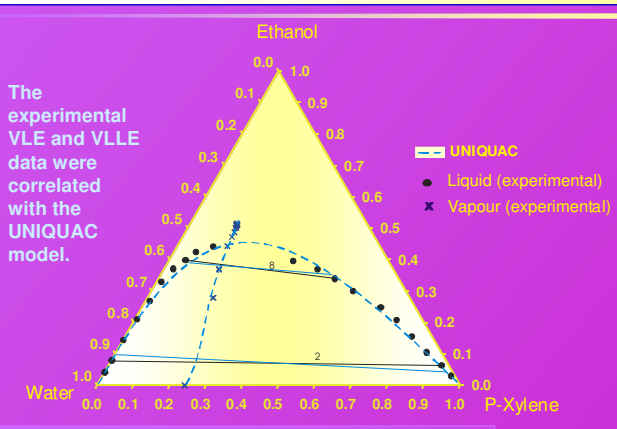


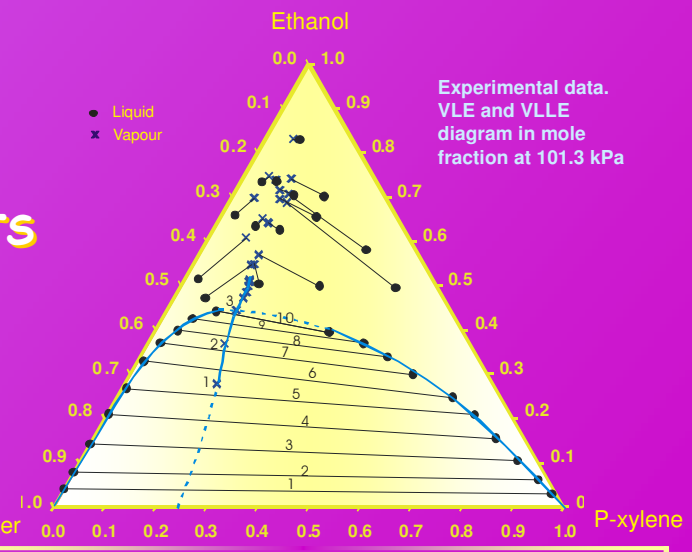
Gaseous samples were injected into the GC through an 6-port valve. The tube walls were superheated. The analytical work was carried out by chromatography.

For the sampling of the liquid phase in the heterogeneous region, a small amount of the liquid coming from the separation chamber of the instrument was diverted to a tube using a solenoid valve. A sample of each layer, at their bubble point, was analyzed by chromatography.

RESULTS

The experimental VLE and VLLE data were correlated with the UNIQUAC model.





Experimental data. VLE and VLLE diagram in mole fraction at 101.3 kPa

The analysis of the results show the existence of a homogeneous ternary azeotrope whose composition agrees with data by Fele et al. (2000).

REFERENCES
(1) V. Gomis, F. Ruiz, J.C. Asensi, Fluid Phase Equilib. 172 (2000) 245-259
(2) L. Fele, N. Zitko, V. Grilc, J. Chem. Eng. Data. 45, (2000) 784-791