IIR International Conferences
Thermophysical Properties and Transfer Processes of Refrigerants.
Vicenza Italy, 31 Aug. – 2 Sept, 2005

MEASUREMENT AND MODELLING OF LIQUID-VAPOR EQUIILIBRIA AND VOLUME PROPERTIES APPLIED TO REFRIGERANT MIXTURES.

F. Rivollet, C. Coquelet, C. Jarne, A. Valtz, D. Richon
Dominique.richon@ensmp.fr
Ecole Nationale Supérieure des Mines de Paris,
CEP/TEP, 35 rue Saint Honoré, Fontainebleau, France

- ABSTRACT -

To solve new economical and environmental constraints accurate knowledge of phase equilibria and volume properties are required, in particular for process design, ie : transport operations, thermal units, etc. As a consequence, industry needs models that can provide very accurate thermophysical properties of fluid mixtures in a large range of pressures and temperatures. Today unfortunately, pure predictive models are not reliable enough to replace experimental data. Thus, experimental data are essential to develop optimized continuous representation of thermophysical properties. Different experimental apparati are presented in this paper : static analytic method, synthetic method and vibrating tube densimeter. In the refrigerant field, the need of VLE data being very high, our laboratory has published several data sets concerning various refrigerant systems (binaries and ternaries). The systems presented in this paper concerns :
- binary and ternary systems with 1,1,1,2,3,3,3-Heptafluoropropane (R227ea), Difluoromethane (R32) (two hydrofluorocarbons) and propane,
- binaries of R227ea or R32 with CO_2 and an old refrigerant SO_2
- ternary system composed of Dimethyl Ether (DME), Pentafluoroethane (R125) and 1,1,1,2-Tetrafluoroethane (R134a)
- two binary systems involving DME with R134a and R32.
To represent the phase equilibria and density measurements, we have focused our attention on two types of models. The first one is a thermodynamic model implying Equations of State and several mixing rules. The second one is neural network model, used to calculate thermodynamics properties like enthalpy, entropy from density values. It has been applied to represent density data of the R134a + R125 + DME ternary system.

Corresponding author :

D. Richon
Laboratoire de Thermodynamique et des Equilibres entre Phases
Ecole Nationale Supérieure des Mines de Paris
35 rue Saint Honoré
F-77305 Fontainebleau Cedex

dominique.richon@ensmp.fr