

THE DEVELOPMENT OF ORGANIC FLUORINE COMPOUNDS AS WORKING FLUIDS FOR ABSORPTION HEAT PUMPS

D. G. Brown, G. H. E. Leather, R. L. Powell, P. Rathbone and J. Speedy
ICI C&P Ltd, R&T, The Heath, Runcorn, Cheshire WA7 4QD (U.K.)

The gas fired absorption heat pump provides a potentially more efficient alternative to the standard gas fired central heating boiler. The working fluid consists of a mixture of a volatile solute and an involatile solvent, whose thermodynamic properties play a key role in the economics of the pump.

The mixtures should show large negative deviations from Raoult's law at the absorber temperature and becoming less marked as the temperature is raised to that of the generator. These requirements imply strong solute-solvent interactions such as provided by hydrogen bonding or complex formation, and guided our search for useful mixtures.

The thermodynamic requirements for the heat pump will be reviewed. Thermodynamic measurements on a wide range of mixtures will be described and the results presented as trends with changing molecular structure. Solute prepared, include fluorinated derivatives of alkanes, cycloalkanes, ethers and amines. Solvents selected were either electron pair donors eg tetraglyme, 1,3-dimethyl-2-imidazolidone; or weak acids, including a range of halogenated phenols.