Ecole Doctorale des Sciences Fondamentales

Title of the thesis: New technological fluids for refrigerated systems: experimental and modeling thermodynamic

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Summary :

The aim the project is the characterization of {CO_2 -HFO} or {CO_2 –oxygenated organic molecule} systems to consider their potential as technical fluids in refrigeration machines (heat pump, organic rankine cycle). These systems could be proposed as an alternative to chlorofluorocarbon (CFC) or hydrofluorocarbon (HFC) for refrigeration. The technological development of thermal machine required the knowledge of thermodynamic properties and phase diagram of the fluid system. The representation of thermodynamic properties and phase equilibrium is based on equations of state, Gibbs energy models ou molecular simulation. The development of theoretical tools necessitate experimental data to adjust interaction parameters and to evaluate model performance for prediction of thermodynamic properties and phase equilibria. Currently only few data is available at sub ambient temperature. The experimental part of the project will consist in the development of experimental techniques for determination of isobaric heat capacities, enthalpies and densties at low temperature and high pressure. This work will be based on the experience of the laboratory in calorimetry, differential scanning calorimetry(2) for heat capacity and flow technique for enthalpy of mixing(3-4).Gibbs energy or activity coefficient models will be adjusted during project to fit collected experimental data and the development of equation of state will be followed through collaboration with external research group.

1-European Environment Agency, Fluorinated greenhouse gases 2013, EEA Technical report No 15/2014
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3-J.Y. Coxam, S. E. Gillespie, J. L. Oscarson, and R. M. Izatt, J. Chem. Thermodyn. 27, 1133 (1995).
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