

An Experimental Investigation of the Caloric Properties for Isobutene + Compressor Oil Solutions

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The use of ozone-safe natural refrigerants has stimulated the development of new compressor oils to optimize the performance of refrigeration systems. The efficiency of refrigerating plants, in particular, the heat exchange in an evaporator and condenser of the refrigeration system depends on the choice of refrigerant and the optimal choice of compressor oil. Therefore, accurate data on the caloric properties such as an enthalpy and heat capacity for the refrigerant + oil solutions (ROS) are required for correct analysis of refrigerating cycles and correct evaluation of the efficiency of the refrigerating system. Unfortunately, information on the caloric properties for the refrigerant + oil solutions (ROS) is practically absent. In order to obtain accurate information on the caloric properties for ROS (R600a + mineral compressor oil WF15A) an experimental setup has been constructed. For measurement of the enthalpy and heat capacity, the method of mixing in ice calorimeter was used. This method provides nearly adiabatic conditions and makes it possible to obtain reliable experimental data. This report presents experimental data for the enthalpy and heat capacity for mineral oil WF15A and for ROS (R600a + WF15A) over a wide range of temperatures (from 273 K to 353 K) and concentrations. The uncertainty in the measurements of the enthalpy for the ROS does not exceed 0.6-0.75 kJ/g. The calculation shows that value of the excess enthalpy may reach up to 7 J/kg. It also is shown that existing computation method cannot correctly estimate the value of the excess enthalpy for the ROS. Based on the results obtained, the temperature and concentration dependencies of the caloric properties for the ROS R600a + WF15A have been elucidated.