

SOLUBILITY OF CO₂ IN A SYNTHETIC OIL

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Abstract

For environmental reasons which involve a reduction of the greenhouse effect gases emission, carbon dioxide is an attractive substitute to replace the conventional refrigerants. However, the reliability and energy performances of refrigerating units require a suitable choice of lubricant. The oil miscibility and solubility are important parameters to make this choice.

An experimental study for the determination of the CO₂ solubility in a synthetic oil (EA 318-120) of Polyalkylene-glycol (PAG) type has been performed for temperatures ranging from -20°C to 60°C. As few information on solubility are available for CO₂/oil mixtures, this study first aims to increase the current data base.

Most of experimental facilities used for the refrigerant solubility measurement in oil consist of a glass cell. This type of experimental equipment presents the disadvantage of being fragile, with a limited working pressure and a high cost. In the present study, the experimental set-up consists of a simple stainless steel cell in which the working pressure can exceed 10 MPa. However, a specific data reduction procedure is necessary as the miscibility limits and the volumes occupied by oil or refrigerant cannot be measured from visual observations.

The measurements of solubility show that CO₂ is soluble with oil for CO₂ mass fractions lower than 50%. The experimental measurements were correlated with a simple function. The average deviation of the prediction with respect to the experimental data is 6.5%.

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