

Thermophysical Properties of Alternative Refrigerants for R-22

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Thermophysical properties including boiling point, critical temperature, heat of vaporization at the normal boiling point and ideal gas heat capacities of fluorinated ether, sulfur and hydrocarbon mixtures are presented. The coefficient of performance (COP) for the mixtures is estimated and reported at two different application conditions for these mixtures from thermodynamic literature data using methods of Morrison and McLinden (1986) along with a developed mathematical model which requires only boiling point, critical temperature, heat capacity, heat of vaporization and vapor pressure data. The relative COP values are reported as comparison to that of R-22. The relative COP values of mixtures and pure compounds range from 0.511 to 1.132. The best COP values relative to those of R-22 are for $\text{CH}_3\text{CH}_2\text{F}$ with the values, 1.132 and 1.124 for both low temperature and high temperature applications respectively. The alternatives identified in this work that have the highest potential as an R-22 replacement are $\text{CF}_3\text{OCF}_2\text{H}$, the binary mixtures of $\text{CF}_3\text{SCF}_3/\text{CH}_3\text{CF}_2\text{F}$ and the ternary mixtures of $\text{CF}_3\text{OCF}_2\text{H}/\text{CF}_2\text{H}_2/\text{CH}_3\text{CH}_2\text{F}$, $\text{CF}_3\text{OCF}_2\text{H}/\text{CF}_2\text{H}_2/\text{CH}_3\text{CF}_2\text{H}$ and $\text{CF}_3\text{OCF}_2\text{H}/\text{CF}_2\text{H}_2/\text{CF}_3\text{CH}_2\text{F}$.