Evaluation of HFO-1234yf as a Replacement for R-134a in Refrigeration and Air Conditioning Applications

Thomas Leck [C, S]
DuPont, Wilmington, DE, U.S.A.

In response to concerns about the contribution of fluorocarbon refrigerants to global climate change, the DuPont Company and Honeywell have cooperated in the development of a new, more environmentally sustainable, refrigerant molecule. This new molecule is the hydrofluoroolefin 2,3,3,3,-tetrafluoroprop-1-ene, or HFO-1234yf. The molecule has been shown to be stable inside auto AC equipment, but to quickly decompose when released into the atmosphere. The initial work with this molecule was directed toward the needs of the mobile air conditioning industry, to meet the terms of the European Union F-Gas directive for new auto models sold in Europe beginning in year 2011. This paper reports on results of work done within the DuPont laboratories to extend the application range of this molecule into other areas. This paper will include results of work to develop a equation of state model for calculation of thermophysical properties of this new molecule. Thermodynamic cycle calculations have been performed to compare this new gas with R-134a in a refrigeration system. Results of work to evaluate the stability and compatibility of this gas with refrigeration system materials, and evaluations of the performance of this gas as a working fluid in other applications are described.