

Physical Properties and Equation of State for Trans-1,3,3,3-Tetrafluoropropene

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Insulating foam is used in a variety of applications from reducing your home energy needs to reducing the cost of running a refrigerator. Insulating foams have the unique ability to both insulate and add structural integrity to a support. By the very use of insulating foam it is possible to reduce the impact on the environment by decreasing the energy consumption of the insulated device. It is also important however to look into low global warming potential (GWP) blowing agents that are used in the creation of the insulating foam to further reduce the environmental footprint. Blowing agents and refrigerants have evolved as environmental awareness and scientific modeling of the environment has improved. The transition from CFCs → HCFCs → HFCs has decreased the environmental footprint of common blowing agents and refrigerants. Due to rising concern over global warming a new class of blowing agents and refrigerants is once again required. A new low GWP refrigerant hydrofluoro-olefin trans-1,3,3,3-tetrafluoropropene (HFO-1234ze(E)) has been developed. HFO-1234ze(E) has a very short atmospheric lifetime of 0.04 yrs and a GWP of 6. In order to test the effectiveness of HFO-1234ze as a blowing agent or refrigerant the physical properties must be determined. It is important that the insulating performance and foaming ability of a new low GWP blowing agent does not degrade over the current standard which uses HFC-245fa. The critical temperature and normal boiling point have been experimentally determined. The temperature dependant vapor pressure, density, surface tension and viscosity of HFO-1234ze(E) have also been measured. An equation of state has been regressed from the experimental data and is reported in the paper. The physical properties of HFO-1234ze show that can be effective as a blowing agent, refrigerant or chiller fluid.