

Theoretical and Experimental Research on the Flammability of HFO-1234ze(E) and HFO-1234ze(E)/HFC-161

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The use of HCFCs (hydrochlorofluorocarbons) refrigerants and their traditional substitutes (such as R410A, R407C etc.) are not environmentally friendly, since they possess the slight ozone depletion potential (ODP) and large global warming potentials (GWP). As one of the candidates of the new generation refrigerants, HFO-1234ze(E) possesses the suitable thermodynamic properties and small climate change effects. Researchers have studied the possibility of using HFO-1234ze(E) as a refrigerant in chillers. However its flammability has not been determined completely. This paper contributes to the fundamental flammable characteristics and influence mechanism of HFO-1234ze(E) as well as its blends mixed with refrigerant HFC-161 (fluoroethane) theoretically and experimentally. Firstly, the flames were investigated under various testing conditions. And then the influences of humidity of air and the lubricating oil on the flammability limits of HFO-1234ze(E) were tested and analyzed. The results indicated that the water vapor played an obvious impact on the flammability of HFO-1234ze(E), leading to the flammability ranges of about 7.4% in volumetric concentration. As for the lubricating oil, the influence on flammable characteristic of HFO-1234ze(E) depended on the mixing conditions. Thirdly, both the lower flammability limits (LFLs) and upper flammability limits (UFLs) of HFO-1234ze(E)/HFC-161 were tested under ten different concentration ratios. The results showed that HFO-1234ze(E) possesses a slight flame suppression effect on HFC-161 but could not make it unburnt completely under the experimental conditions.