

Current State and the Future of Refrigerants for Refrigeration and Air-Conditioning

-Considering their Thermophysical Properties-

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Introduction

The refrigeration and air conditioning equipment are indispensable products in civilized society that had advanced from the Industrial Revolution and is growing rapidly. The amount of energy consumed by refrigeration and air conditioning including supplying hot water, reaches about 15% (2400×10^{15} J) of the domestic consumption energy in Japan. However, discharged refrigerants used in the equipments and exhausted carbon dioxide to drive the refrigeration and air conditioning equipment are related to serious environmental problems and energy problems. The destroyed ozonosphere by the refrigerants discharged from the refrigeration and air conditioning equipment into the atmosphere (depletion of ozone layer) and the normal temperature goes up by green house gases such as carbon dioxide (global warming) are especially sounded as serious global problems.

There is an important relation between refrigeration cycle (vapor compression cycle) and refrigerant, so the performance and the characteristics of the refrigeration cycle change depending on the physical properties of the refrigerant. To develop an equipment that alleviates environmental problems and energy problems, a suitable refrigerant for each usage must be selected, and the cycle and the element parts should be designed and developed. In this paper, the current state of the refrigerants used for refrigeration and air conditioning equipments are introduced. And the future of refrigeration and air conditioning equipments are considered from the viewpoint of thermophysical properties of the refrigerants.