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The Mass and Heat Transfer Process Through the Door Seal of Refrigeration

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Abstract As one of the main reasons causing leakage heat load in a refrigerator, mass and heat transfer through refrigerator door seal is of great importance to be studied. In this paper, a model is presented for numerical simulation of mass and heat transfer process through refrigerator door seal, and an experiment apparatus is designed and set up as well for comparison. A two-dimensional model and tracer gas method are used in simulation and experiment, respectively. It can be found that the relative deviations of air infiltration rate between the simulated results and experimental results were less than 1%, and the temperature difference errors at two special points of the door seal were less than 2.03 °C. In conclusion, the simulated results are in good agreement with the experimental results. This paper initially sets up a model that can accurately simulate the heat and mass transfer through the refrigerator door seal, and the model can be used in refrigerator door seal optimization research in the follow-up study.

Keywords Refrigerator Door Seal; Air infiltration; Numerical simulation; Tracer gas method

1 INTRODUCTION

Refrigerator heat load consists of latent heat load, electric heat load and leakage heat load. Among these, leakage heat load is the biggest one, accounting for about 75%. Although refrigerator door seal can decrease leakage heat load much, there still exist mass and heat transfer through the gap between seal and chamber, which results in a lot of energy loss. In order to decrease leakage heat load as much as possible, it is of great importance to accurately predict the mass and heat transfer through door seal.

In recent years, a few related studies have been carried out. C. Afonso[1] introduced tracer gas method to quantify the rate of air infiltration through refrigerator door seal.

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