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## An Experimental Study On the Frost Characteristics on A Vertical Aluminum Flat Plate

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## **Extended Abstract**

Frost forms when water vapor encounters a cold surface below 0 °C. Frost formation on the heat exchanger surface in refrigeration systems is an inevitable phenomenon [1]. Frost on the heat exchanger disrupts the airflow, causing pressure drop, and acts as thermal resistance degrading heat transfer performance. Frost formation leads to an increase in operational costs and energy consumption. For these reasons, frost delay methods are necessary in refrigeration systems. Frost delaying methods are devised based on an exact understanding of frost formation. Despite numerous studies on frost formation, most of the studies have focused on horizontal plates. Owing to differences in frost characteristics between vertical and horizontal plates, the lack of studies on vertical plates impedes understanding of frost formation [2,3]. Thus, the study on frost formation on vertical plates is essential.

In this study, frost characteristics on vertical plates under various conditions were measured and compared with those on horizontal plates. Frost thickness and frost density were measured according to ambient temperature, relative humidity, and surface temperature. The ambient temperature and relative humidity were controlled using a psychrometric chamber and surface temperature was adjusted with a thermoelectric cooler. Frost thickness on vertical plates increased with higher ambient temperature, relative humidity, and lower surface temperature, which is the same as that on horizontal plates. Despite the identical frost thickness trend, frost thickness under the same experimental conditions was different according to plate direction. Frost thickness on vertical plates was always lower than that on horizontal plates at the same conditions. Furthermore, the difference in frost thickness between plate directions increased when frost formation environmental factors changed to promote frost growth. Frost density trend according to surface temperature was identical in each plate direction. However, frost density trend based on relative humidity on vertical plates were opposite to that on horizontal plates. Frost density increased with higher relative humidity on horizontal plates, whereas it decreased on vertical plates with higher relative humidity. Frost density also had a different trend according to plate direction under the same experimental conditions. Therefore, plate direction is a new frost formation environmental factor that influences frost formation.

## References

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