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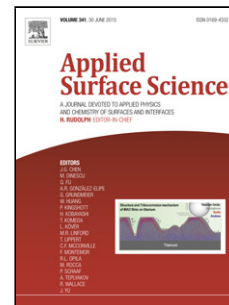
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# The effect of surface modification on initial ice formation on aluminium surfaces

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## Abstract

One of the most promising energy saving methods in cold climate areas is heat recovery in ventilation system by using air-to-air heat exchangers. However, due to a higher humidity in the exhaust air, there is a risk of ice formation on the heat exchanger fins at subzero temperatures. Since the main material of heat exchanger fins is aluminium, this paper focuses on the effect of aluminium wettability on the initial stages of ice formation. The ice growth was studied on bare as well as hydrophilically and hydrophobically modified surfaces of aluminum (8011A) sheets, commonly used in heat exchangers, at different psychrometric parameters. The obtained results show that the surface modification of aluminium plays a crucial role in the ice formation. We demonstrated that flat hydrophobic surfaces exhibit slower ice growth and denser ice layers, hence making this type of treatment preferable for aluminium heat exchangers. Furthermore we provide an explanation for a commonly observed phenomenon that bare aluminium surfaces are characterized by a faster ice growth and less dense ice layer as compared to both hydrophilically and hydrophobically modified surfaces.

**Keywords:** Aluminum, Surface modification, Ice formation, Hydrophobicity, Hydrophilicity

## 1. Introduction

Heat recovery in ventilation systems with an air-to-air heat exchanger is one of the most promising energy saving methods, which can reduce energy demand in a cold climate. On the other hand, in the case of subzero inlet air temperature, the surface temperature of the heat exchanger fins

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