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# Low Ice Adhesion Surfaces Using Microtextured Hydrophobic Tapes and Their Applications in Refrigeration Systems

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## **Abstract**

A low ice adhesion surface was generated using microtextured hydrophobic tapes. The surface microtexture was achieved by coating structural bonding tape with polytetrafluoroethylene (PTFE) powder. This technique required no chemicals or complex curing mechanisms. By introducing two powders with different average grain sizes, the surface microtexture was able to be varied for comparative testing. The average grain size ranges, and therefore the surface microtexture feature sizes, were 2  $\mu\text{m}$  to 4  $\mu\text{m}$  and 13  $\mu\text{m}$  to 21  $\mu\text{m}$ . The static contact angle varied between 102.1° and 129.1°, and the roll-off angle varied between 33.0° and 14.6°. A higher static contact angle and a lower roll-off angle were associated with a higher weight percent of the larger powder grains. The ice detachment pressure for the 1:10 powder mixture was 128 kPa, and the ice separation time under thermal defrost was 216 s. The powder coated structural bonding tape was applied to the cooling fan for a walk-in freezer. The behavior of ice accumulation due to humidity, as well as the ice removal due to defrost cycles, was qualitatively analyzed. It was found that the microtextured coating significantly reduced ice

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