Contribution ID: **612** Type: **Poster**

M1Po2C-04: Ceramic-Polymer Composite Coatings for Robust Anti-Frosting Surfaces

Monday 10 July 2023 14:00 (2 hours)

Suppressing condensation frosting using superhydrophobic surfaces can have a substantial impact on improving efficiency and safety in many industrial applications. However, the low surface energy coatings on such surfaces can be easily damaged during various harsh operations, which has limited the application potential of passive anti-frosting approaches. Here, we propose robust ceria-based anti-frosting surfaces, where superhydrophobicity is induced by not surface coating but adsorbed hydrocarbon. We also demonstrate how the incorporation of a hydrocarbon source as a binder to the ceria-based coating allows for the quick recovery of superhydrophobicity. In comparison to untreated aluminum surfaces, the developed coatings decreased the frost propagation speed and the ice adhesion strength by 60% and 89%, respectively. The coatings could maintain a low contact angle hysteresis even after 200 cycles of frosting/de-frosting robustness tests and 15,000 cycles of acidity/salinity exposure tests. Using a scalable one-step dipping process, the created coating was incorporated to a fin-tube type heat exchanger, and provided 210% enhanced heat transfer rate and 60% decreased pressure drop. The coatings also provided substantially improved robustness compared to the silane-treated superhydrophobic coating. These findings suggest that the developed ceria-based coatings can be helpful in creating scalable and resilient anti-frosting surfaces for real-world application operating at harsh environment.

Author: NAM, Youngsuk (Korea Advanced Institute of Technology and Science)

Co-authors: Dr SHIM, Jaehwan (Korea Advanced Institute of Science and Technology); Mr KIM, Jun Soo (Korea Advanced Institute of Science and Technology)

Presenter: NAM, Youngsuk (Korea Advanced Institute of Technology and Science)

Session Classification: M1Po2C: Metallic, Ceramic, Composite and Polymeric Materials II