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Case ID:M14-139P
Published: 5/7/2015

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Bi-Layer Multifunctional Coating For The Prevention of Icing

Frost and ice accumulation are major safety and performance concerns for aircraft, sea vessels, wind turbines, and off-shore oil platforms. A common and effective way to prevent ice buildup is to apply chemicals that lower the freezing temperature of water. In wintery conditions antifreeze is routinely sprayed on commercial airliners, and smaller planes can be equipped with a wing antifreeze dispensing system, but the antifreeze quickly dilutes when exposed to rain and other liquid forms of water. Functionally passive coatings such as nanostructured superhydrophobic (water averse) surfaces and lubricant-impregnated surfaces have been alternatives to actively applied anti-icing systems. However, when the nanostructures become frosted over these coatings actually increase ice accumulation and lose functionality.

Researchers at ASU have created a bi-layer multifunctional coating with static and dynamic surface interactions for preventing ice accumulation. In the absence of frost or condensation, the outer layer prevents ice accumulation by repelling impinging droplets, whereas the accumulation of frost stimulates antifreeze secretion, effectively melting the ice without using any more antifreeze than necessary. While the antifreeze will eventually need to be replenished, the bi-layer coating lasts much longer and uses considerably less antifreeze than the leading anti-icing treatments.

Potential Applications

- Anti-Icing for
  - Commercial & Military Aircraft
  - Off-Shore Oil Platforms
  - Sea Vessels
  - Wind Turbines
- Phase Change Enhancement
- Protective Coatings

Benefits and Advantages

- Durable – Much longer lifespan than current commercial coatings.
- Economical
  - Less expensive than nanostructured or lubricant-impregnated surfaces.
  - Saves on the cost of antifreeze.
- Effective – Antifreeze does not get diluted by water.
- Efficient – Optimal amount of antifreeze is used at a time.

For more information about the inventor(s) and their research, please see

Dr. Konrad Rykaczewski's directory webpage