

Anti-ice coatings: Science or Fiction?

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Abstract

The prevention of icing on surfaces is an aim in many technical fields because this would ensure the operability and reliability of engines and constructions, even in cold climates. Varying terms occur on the market for coatings that shall prevent ice formation and/or adhesion, e.g. icephobic, anti-ice or ice-release. However, it has to be clearly stated that it is very unlikely that a coating is able to prevent all types of ice formations on surfaces under all kinds of conditions. In fact, our experience showed that for varying technical applications different coating approaches are convenient.

Passive approaches, including the change of wetting behaviour or the reduction of ice adhesion, as well as active approaches with chemical and biochemical background are in focus of our comprehensive research activities. For instance, one of the most promising approaches is a coating that contains nano hydrophilic centres in a hydrophobic surrounding. Investigations have shown that such a coating prevents rime formation to a certain degree compared to unstructured coatings.

For the evaluation of anti-ice coatings Fraunhofer IFAM is more and more extending the test methods to be able to predict the icing behavior under different icing conditions and to adapt the coating developments to the specific needs. For instance, tests cover rime ice and clear ice accretion on flat surfaces as well as the formation of ice on leading edges and runback ice. Furthermore, scientific knowledge is gained using analytical methods to investigate icing mechanisms. This will also be presented in greater detail in the proposed contribution.

Our intensive work on new anti-ice coatings won't bear miracles, but rather specific solutions for end users. The most effective solutions are identified for specific needs on the basis of scientific knowledge meaning that coatings which fulfill technical requirements improve the icing behavior of surfaces.