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Mgr inż. Michał Piłkowski

Streszczenie w języku angielskim

The occurrence of Icing in aviation and energetical industries is serious problem which cause high exploitation costs, human effort, malfunction risks and less effective energy generation by wind turbines. Therefore novel research on anti-icing and de-icing systems is rising its interest in field of coating and material science. Current solutions heavily rely on electricity-consuming active antiicing systems. However passive anti-icing systems are getting more interest due to their advantages which are: Less risk of malfunction because they are working constantly, lower costs because they tend to work for several years upon being applied and being more ecological solution due to elimination of toxic de-icing liquids. In response to market demand this work focuses on designing novel coating material which shows desired surface properties which prevents the ice accumulation and also is meeting requirements of industry in terms of its development. To achieve this, materials wettability and ice adhesion properties have to be designed by chemical modification and surface texturization.

This work covers methodology and results on chemical modification, optimization and characterization of epoxy resin formulation, which can be successfully applied as an passive anti-icing system. The hydrophobic and anti-icing properties were obtained using volume modification, while the desired surface structure was obtained by filler selection and sandblasting procedure. As an result, new composite material was created, which meets earlier mentioned assumptions of an passive anti-icing system. It was important to obtain composite materials with hydrophobic and low ice adhesion properties in their entire volume, so the material does not lose its properties after scratching. Later studies focused on material characterization and covers examination of: wettability (WCA, SFE), ice adhesion (IA) resistance to environmental conditions (accelerated aging) as well as the coefficient of friction and bending resistance. At the end, wind tunnel tests and drone flight tests were carried out. Tests in a wind tunnel simulating icing conditions (applied to the drone's wings) during flights where performed in winter conditions. The produced material shows low ice adhesion and high hydrophobicity, and in icing conditions, no ice coating was observed on its surface, which allows the composite to be tested in real conditions and proof that its worth to commercialize presented technology.