

Substituting PFAS modifiers with more sustainable alternatives in passive ice-phobic epoxy composite coating

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Streszczenie

Traditional antiicing systems, typically based on active methods, often require additional energy input or contribute to environmental pollution. Hence, there is a significant market demand for more environmentally friendly and passive solutions. This study explores the development of passive antiicing coatings with alternatives to the perfluoro compounds commonly used in epoxy composite coatings. Due to the environmental and health hazards of per- and polyfluoroalkyl substances (PFAS) compounds, this work presents an approach to exchange 3-(perfluorooctyl)-1,2-propenoxide by alternative additives such as 1,2-epoxyhexadecane, or 1-aminohexadecane, or 1-pentadecanecarboxylic acid. The influence of these additives on the properties of rough epoxy coating filled with micro- (SiO_2) and nano-particles (Al_2O_3), such as on surface wettability and antiicing properties (e.g., ice nucleation times or ice adhesion), was investigated. FTIR, TGA, DSC, CLSM, and SEM-EDS were used to characterize obtained coatings. The coating with the acid additive could be used as a viable alternative, although the large roughness heterogeneity of the coatings studied would still require further optimization.

Słowa kluczowe

Composite coating, Epoxy resin, Non-fluorinated coatings, Icephobicity, Anti-icing, Hydrophobicity

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