Influence of Surface Properties and Impact Conditions on Adhesion of Insect Residues

Insect residues can cause premature transition to turbulent flow on laminar flow airfoils. Engineered surfaces that mitigate the adhesion of insect residues provide, therefore, a route to more efficient aerodynamics and reduced fuel burn rates. Areal coverage and heights of residues depend not only on surface properties, but also on impact conditions. We report high speed photography of fruit fly impacts at different angles of inclination on a rigid aluminum surface, optical microscopy and profilometry, and contact angle goniometry to support the design of engineered surfaces. For the polyurethane and epoxy coatings studied, some of which exhibited superhydrophobicity, it was determined that impact angle and surface compositions play critical roles in the efficacy of these surfaces to reduce insect residue adhesion.

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Christopher J. Wohl, Ph.D., has a background in interfacial and adhesion science, polymer and small molecule synthesis, spectroscopy, and kinetics. Currently, Dr. Wohl's research is the generation and characterization of materials and surfaces for minimizing adhesion of particulates and insect residues on dynamic surfaces is being investigated. Several different approaches are being pursued including synthesis of polymeric materials with controlled surface chemistries and topographical engineering of polymeric surfaces using nano-scaled inorganic materials, plasma exposure, laser ablation patterning, and photolithography.