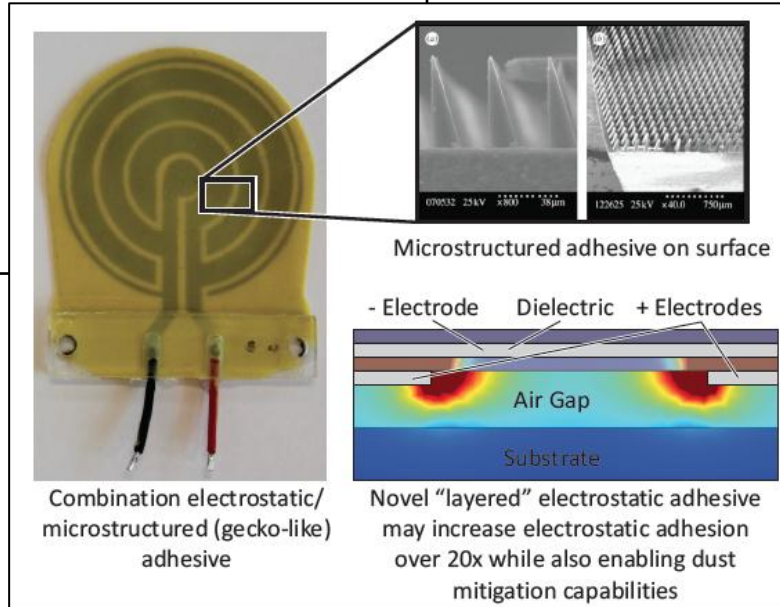


A Novel Electrostatic/ Microstructured Adhesive with Dust Mitigation Capabilities

- **PI: Prof. Matthew Spenko**
Illinois Institute of Technology
- **Collaborator: Dr. Aaron Parness**
Jet Propulsion Laboratory



Research Objectives

- Develop a novel electrostatic/microstructured (gecko-like) adhesive with an order-of-magnitude improvement of electrostatic adhesion coupled with the unique ability to shed dust particles
- Elevate electrostatic adhesion levels to be on par with microstructure adhesion levels
 - Initiate first known research to date on dust mitigation of microstructured adhesives
 - Start TRL - 2. Concept and application have been formulated
 - End TRL - 3. We will deliver experimental proof-of-concept of increased adhesion and dust mitigation

Approach

- FEA models optimize electrode geometry for adhesion
- Prototypes are fabricated and adhesion pressure is experimentally validated
- Prototypes experimentally tested for dust mitigation under both controlled and "real-world" conditions
- Gripper fabricated according to payload restrictions of free flying Astrobees/SPHERES class robots
- Gripper and adhesives experimentally validated using autonomous perching micro air vehicle testbed

Potential Impact

- Increase system-level performance to allow the Astrobees/SPHERES class of free-flying robots to exert high inertial loads during docking or perching
- Enable adhesion to rough surfaces and fabrics
- Dust mitigation significantly improves reliability and allows repeated use without the need for a human to frequently and repeatedly clean the adhesives by hand
- Applications in orbital debris removal, satellite servicing, as well as in-space assembly, manipulation, and docking