Texas Tech University - Department of Mathematics and Statistics
Seminar in Applied Mathematics

Bioinspired Reusable Adhesives: Design, Manufacturing and Characterization

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ABSTRACT. Gecko lizard has an exceptional ability to climb on most natural and synthetic surfaces effortlessly with a speed that is unmatched in the animal kingdom. In addition, while climbing, geckos leave no residue, can repeatedly attach and detach, and are not affected by dirt or dust. Recent studies have revealed that the gecko owes this unique skill to the dense, fine fibrillar structuring on their feet. This structure is hierarchical in nature and is composed of plate like structures (lamella) decorated by micro-scale fibers (setae) which branch down to nanoscale fibers with specialized terminal endings. A synthetic version of this structure could be the solution to the lack of repeatable adhesives with potential applications in the robotics, textile, medicine, and space industries. In this talk, the mechanism behind the adhesive capability of the gecko in relation to the geometry, orientation, and material properties of the fiber structures on its feet will be discussed. Fabrication and characterization results for synthetic fibrillar adhesives will be presented. Specific focus will be given on the developed adhesion models and how they are used to design, optimize, and fabricate bioinspired fibrillar adhesives.