MAR08-2007-006315

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Carbon Nanotube-Based Synthetic Gecko Tapes

ALI DHINOJWALA, The University of Akron

Wall-climbing geckos have unique ability to attach to different surfaces without the use of any viscoelastic glues. On coming in contact with any surface, the micron-size gecko foot-hairs deform, enabling molecular contact over large areas, thus translating weak van der Waals (vdW) interactions into enormous shear forces. We will present our recent results on the development of synthetic gecko tape using aligned carbon nanotubes to mimic the keratin hairs found on gecko feet. The patterned carbon nanotube-based gecko tape can support a shear stress (36 N/cm^2) nearly four times higher than the gecko foot and sticks to a variety of surfaces, including Teflon. Both the micron-size setae (replicated by nanotube bundles) and nanometer-size spatulas (individual nanotubes) are necessary to achieve macroscopic shear adhesion and to translate the weak vdW interactions into high shear forces. The carbon nanotube based tape offers an excellent synthetic option as a dry conductive reversible adhesive in microelectronics, robotics and space applications. The mechanism behind these large shear forces and self-cleaning properties of these carbon nanotube based synthetic gecko tapes will be discussed. This work was performed in collaboration with graduate students Liehui Ge, and Sunny Sethi, and collaborators from RPI; Lijie Ci and Professor Pulickel Ajayan.