

Materials Day 2007: Sticking and Sliding, Wearing and Tearing

Tribology and Adhesion Issues in Materials Science

«Do we understand Gecko adhesion? On single spatulae and biomimetic nanostructures»

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The capability of many animals and specifically geckos to climb on vertical surfaces has recently attracted a significant amount of attention. A biomimetic approach to this phenomenon bears great potential for novel nanotechnological products as replacements for classical adhesives. A replication of the essential components of the gecko adhesive system requires a basic understanding of the underlying adhesion mechanisms. It is debated in literature, whether the adhesion of single spatulae depends solely on Van der Waals interaction or on capillary forces. In this talk we show that both mechanisms contribute equally to gecko adhesion by AFM based single spatula pull-off experiments. Experiments were performed at different humidity levels and on substrates exhibiting a range of contact angles and roughnesses. In summary, geckos adhere best on damp surfaces with an ideal roughness. Design rules for ideal biomimetic structures are also presented.