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René Hensel

INM – Leibniz Institute for New Materials, Germany

Bio-inspired elastomeric adhesives for novel pick-and-place concepts

Strong, but reversible adhesion to diverse counter surfaces has attracted the attention of several research groups worldwide. Inspired from concepts found in biology, micropatterned dry adhesives were identified as promising candidates, particularly due to their potential for the development of novel pick-and-place concepts. Whereas, fundamental principles and design guidelines of such adhesives to handle objects with smooth surfaces have already been reported in several reports; current developments undergo rapid progress towards applications in non-ideal conditions. Here, we will discuss the impact of surface roughness among other scenarios such as elevated operating temperatures and a reduced air pressure. As an example, surface roughness substantially reduces contact area; however, we found that an appropriate design of the surface pattern can lead to acceptable adhesion performances. By an intense interplay between experiment and theory, we studied a new composite design that maintains the structural concept of contact splitting in combination with soft materials to overcome critical issues in contact formation such as the strain energy penalty. Our developments demonstrate practical solutions for current limitations and might pave the way for emerging applications of bio-inspired pick-and-place systems in the real world.

Biography

René Hensel studied Materials Science at the TU Dresden, Germany. He was a fellow of the DFG Research Training Group 1401/2 at the TU Dresden and did his Doctorate at the Leibniz Institute of Polymer Research Dresden (IPF) and the Max Bergmann Center of Biomaterials Dresden (MBC). He was honored with the International Bionic Award 2014 from VDI for his PhD thesis on free-standing polymer membranes for omniphobic surface coatings. Since 2014, he has been the Deputy Head of the Program Division Functional Microstructures at Leibniz Institute for New Materials Saarbrücken, Germany.

rene.hensel@leibniz-inm.de

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