Beitrag ID: **7** Typ: **Talk**

Thickness of nano-scale poly(dimethylsiloxane) layers determines the motion of sliding water drops

Mittwoch, 6. Dezember 2023 12:20 (25 Minuten)

Nanometer thick layers of polydimethylsiloxane (PDMS) are widely applied as hydrophobic coatings because they are environmentally friendly and chemically inert. In many applications, low friction of water drops is required. While the onset of motion (static friction) has already been studied, dynamic friction is less explored. It is not understood which processes lead to energy dissipation and cause friction. Such knowledge is important to minimize drop friction for applications such as heat exchangers or fog harvesting. Here, we measure dynamic friction of water drops on PDMS layers with different thickness and architecture over the whole available velocity regime. The layer thickness L turned out to be a good predictor for drop friction. 4-5 nm thick PDMS layers showed the lowest dynamic friction. A certain minimal layer thickness seems to be necessary to form homogeneous surfaces and reduce the attractive interaction between water and the underlying substrate. The increase of friction above L = 4-5 nm is attributed to meniscus formation at the contact line due to the surface tension of water. When the contact line moves, the meniscus is dragged across the surface. Energy is dissipated due to stretching of chains and viscous dissipation. AFM force and friction experiments support this interpretation. The effect may be enhanced due to an increasing viscosity of the PDMS layer caused by entanglement of the polymer chains.

Hauptautoren: BUTT, Hans-Jürgen (Max Planck Institute for Polymer Research); KOYNOV, Kaloian; AMANN-WINKEL, Katrin; SUDERSAN, Pranav; BERGER, Rüdiger; LI, Xiaomei; ZHOU, Xiaoteng (Max Planck Institute for Polymer Research); WANG , Yongkang; NAGATA, Yuki

Vortragende(r): ZHOU, Xiaoteng (Max Planck Institute for Polymer Research)

Sitzung Einordnung: Short Talks