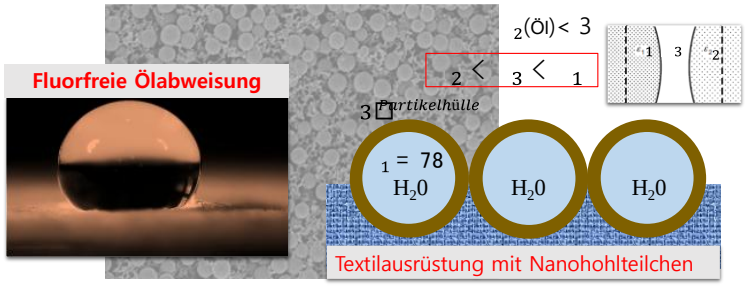
Development of conceptually new fluorine-free repellent textile finishes

Finding substitutes for fluorine-containing compounds that offer the same performance and durability is a major challenge for the textile industry. Although there are many examples of superhydrophobic coatings, progress with highly oleophobic coatings has been limited.
A particular difficulty in developing oleophobic coatings arises from the fundamental limitations of material properties in relation to surface tension.
Current developments based on creating suitable roughness using PDMS or alkyl with low surface energy offer only limited performance.
Unlike with fluorine compounds, there are no universal solutions as oleophobicity can vary greatly depending on the type of oil, unlike superhydrophobicity.
It is not possible to use biomimetic concepts, as there are no examples of superoleophobic surfaces in nature.

Research objective and solution approach:
The project aims to develop a new fluorine-free approach based on the well-known scientific concept of repulsive van der Waals interactions.
Indirect evidence from experimental work suggests that nanoporosity (referred to as 're-entrant structures') reduces wettability with oil.
Using an established theoretical model to interpret these experimental results yields a solution that promotes repulsion by thin layers with an adjusted refractive index.
This project involves developing a method for applying thin polymer layers embedded with SiO_2 hollow nanoparticles containing a hydrophilic inner space. The challenge lies in combining the self-emulsifying amphiphilic copolymers with the modified SiO_2 hollow nanoparticles in textile finishes.



Details of the research project:

Titel:	Development of conceptually new fluorine-free repellent textile finishes
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