Designing Ultra-hydrophobic Surfaces for Rapidly Capturing CO2

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Presentation Description:

Have you ever wondered how raincoats repel water? This presentation will showcase how to design and engineer ultra-hydrophobic surfaces which can keep themselves remarkably dry but also have an interesting application in capturing CO2.

Abstract:

Ultra-hydrophobic surfaces have excellent water repellency and anti-icing properties. These specialized surfaces are made by combining hydrophobic chemistry with micro-texturing of the surface and offer a wide range of applications including corrosion resistance, drag reduction, and self-cleaning. Such surfaces are also commonly found in nature, such as in lotus leaves, insect wings and duck feathers.

Ultrahydrophobicity arises from the trapping of air pockets within textures and reducing the exposed solid fraction to the water. Recent studies have shown that ultrahydrophobic surfaces can also act as bubble-capturing surfaces as they trap gases within the texture. In detail, ultrahydrophobic surfaces retain a film of gas when submerged underwater, creating a water-gas interface. This unique texture property has many applications, one of which includes CO2 capture, where the water-gas interface facilitates capture of incoming CO2 bubbles. To maintain the gas layer underwater and facilitate CO2 dissolution, geometry and spacing of the ultrahydrophobic surface is a determining factor.

The goal of this research project will be to fabricate and characterize ultrahydrophobic surfaces on steel and investigate how to optimize gas-solid interfaces for CO2 capture. In this presentation, I will discuss how these surfaces are designed, and how they are ideal not only for shedding water but also for gas capturing and retention. We will also see how this technology can facilitate direct capture of CO2 from the atmosphere and how it can be expanded for any industrial gas scrubbing application.

References/Acknowledgments:

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