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Self-limiting electrochemical recovery of dewetted state underwater: visualization and performance[1] RYAN FREEMAN, CHANG-JIN "CJ" KIM, University of California, Los Angeles — While superhydrophobic (SHPo) surfaces have garnered much interest with their potential drag reducing ability, they are only effective with a sustained gas layer. Unfortunately, the gas inevitably depletes from passive surfaces in reality due to defects in microstructures and hydrophobic coatings, fluctuations and drifts in the environment, and other factors, making an active gas recovery mechanism necessary. So far, the only practical solution has been the self-limiting electrochemical recovery, which requires no external control and consumes a minimal amount of energy. Here we present direct visualization of gas recovery by electrolysis of water, highlighting the effect of trench geometry and hydrostatic pressure on recovery. A novel fabrication process is developed to prepare the semi-active SHPo surfaces that are optically clear to enable side view observation of gas restoration. Mindful that electrolysis requires energy, the power being expended to recover fully wetted SHPo surfaces of various sizes is measured and evaluated. The study is being expanded to flows in a water tunnel, demonstrating the sustainability of the gas over a range of flow conditions.

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Ryan Freeman
University of California, Los Angeles

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