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**Mass Transfer of Gas on Slippery Superhydrophobic Surface** ELIF KARATAY, PEICHUN AMY TSAI, ROB LAMMERTINK, University of Twente, SOFT MATTER, FLUIDICS AND INTERFACES GROUP TEAM — Superhydrophobic substrates containing gas bubbles are advantageous for generating hydrodynamic slippage. When a viscous liquid flowing upon, bubble surfaces provide shear-free gas-liquid interfaces thereby slippage. Besides, the absorption of gas into the liquid occurs at the bubble surfaces. We experimentally measure and numerically estimate the mass transfer of gas absorption at the stable gas/liquid interfaces for short contacting times. We study the net rate of gas absorption experimentally by in-situ measurements of dissolved oxygen concentration profiles in aqueous solutions flowing over oxygen bubbles using fluorescent lifetime imaging microscopy. We numerically analyze the dynamics of interfacial mass transfer of dissolved oxygen, by considering (i) kinetic equilibrium conditions at bubble surfaces that is conventionally described by Henry's Law and (ii) non-equilibrium conditions at bubble surfaces using Statistical Rate Theory (SRT). Our experimental results show that kinetic equilibrium is not established for short contact times. Mass transfer of gas into liquid flow past micro-bubbles can be well described by our simulations performed with the non-equilibrium theory for short exposure time ($\sim 180$ $\mu$s) of liquid with a microbubble, deviating from the commonly

Elif Karatay
University of Twente

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