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Introducing the Hybrid Free Surface Microfluidics for Gas Sensing MEYSAM BARMI, CARL MEINHART, Department of Mechanical Engineering, University of California Santa Barbara — Free-Surface MicroFluidics (FSMF) have recently received much attention for their applications especially their ability for airborne chemical detection [Piorek, PNAS 2007]. Due to their sensitivity to the ambient condition and possibility of contamination, hybrid configuration is introduced to perform the measurement more accurately. The hybrid free surface microfluidics are combination of free surface and closed surface microfluidics. The gas is absorbed by the working fluid through a small opening on the microchannel and transported to the closed surface reaction chamber to carry out the measurements. The working fluid is transported by surface tension and regulated by temperature-controlled evaporator at the outlet. The microchannels are fabricated on Silicon substrates with built-in Ti/Pt electrodes to measure the conductivity of the working fluid before and after the gas absorption to find the concentration of the absorbed gas. It proves that the hybrid free surface microfluidics are appropriate for gas sensing and the minimum exposing time and required opening size are calculated. Numerical simulations are carried out by COMSOL multiphysics. Navier-Stokes equations along with the mass transport with reaction are solved simultaneously to find the correlation between vapor pressure of the surrounding gas and concentration of the absorbed gas.

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