Influence of Marangoni flows on extraction and reaction performance
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SUBRAMANIAM, Indian Institute of Technology Madras — In this work, the ef-
fect of Marangoni flows on mass transfer is investigated for stratified flow of two
immiscible liquids in a microchannel. Experiments involving reactive extraction of
carboxylic acids from organic phase using aqueous sodium hydroxide are performed.
Often in analysis, the liquid-liquid interface is assumed to be flat. However, a de-
forming interface was observed for certain flow rate ratios. The conditions under
which the interface deforms are determined. The experiments are complemented
with mathematical modeling and simulation. Navier-Stokes equation and transport
equation are simplified using the lubrication approximation and an approximate so-
lution is obtained. The interphase mass transfer and hydrodynamics are coupled
through the shear stress boundary condition. In cases where the interface is flat,
the transport equation is solved numerically using finite difference method. In cases
where the interface deforms, the evolution of interface is captured using kinematic
boundary condition and the transport equation is solved numerically.

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Date submitted: 11 Nov 2014