

NEWS | NOVEMBER 08 2019

Surfactants for manipulating droplets should be used carefully

Anashe Bandari



Scilight 2019, 451105 (2019)

<https://doi.org/10.1063/10.0000265>



View
Online



Export
Citation

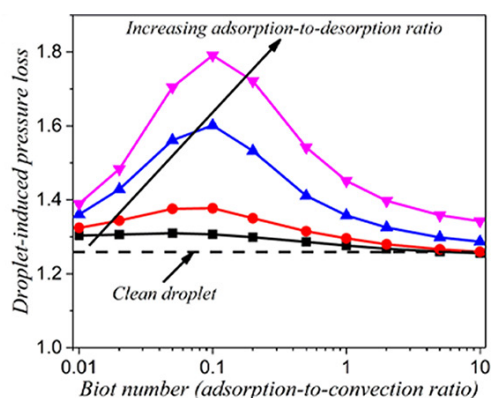
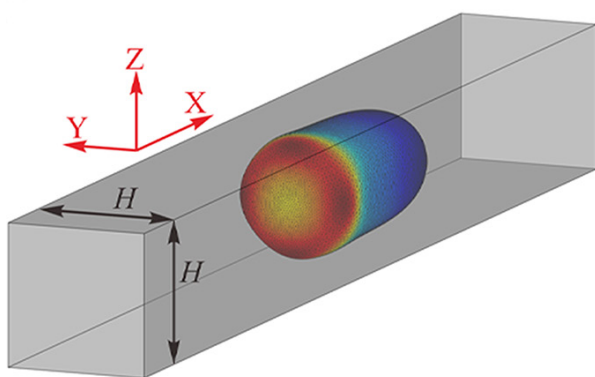
CrossMark

7 November 2019

Surfactants for manipulating droplets should be used carefully

Anashe Bandari

Though surfactants have widespread applications in microfluidics, their effects on droplet dynamics are not well understood.



Surfactants are commonly used to assist in a number of applications, such as underground residual oil recovery, but their effects on droplet motion are not widely studied. In a new paper, Luo et al. examined the dynamics of a surfactant-laden droplet in a microchannel.

Expanding upon their previous research on insoluble surfactants, the authors found Marangoni stress – the tangential surface tension gradient on the drop surface – plays the predominant role over the surfactant-induced surface tension reduction for both soluble and insoluble surfactants. This unexpected contribution from the enlarged Marangoni stress leads to other surprising effects on drop motion.

“This work indicates that the use of surfactants in the manipulation of drop motion in microchannels generally generates a significant side effect,” said author Bo Feng Bai. “As a consequence, we have to evaluate the surfactant-induced Marangoni effect in real applications and find a way to weaken or even take advantage of this Marangoni stress.”

To understand this effect, the authors solved three coupled equations describing the surfactant’s relationship with the droplet’s surface tension, the concentration of the surfactant and its transport on the drop surface. They used this to analyze the flow of a neutrally buoyant droplet in a square microchannel.

The authors note microfluidic technologies that commonly use surfactants to stabilize or displace droplets should consider the significant role played by the Marangoni effect. “The side effects of surfactants induced by the Marangoni stress must be taken into account carefully,” Bai said.

Source: “The effect of soluble surfactant on the motion of a confined droplet in a square microchannel,” by Zheng Yuan Luo, Xing Long Shang, and Bo Feng Bai, *Physics of Fluids* (2019). The article can be accessed at <https://doi.org/10.1063/1.5125949>.

Published by AIP Publishing (<https://publishing.aip.org/authors/rights-and-permissions>).