
Diffusiophoresis: how a pinch of salt can affect mixing of large particles

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Abstract

Diffusiophoresis is a nanoscale mechanism that induces particle transport whenever solute concentration gradients are present: depending on the sign of the diffusiophoretic coefficient D_{dp} , the particles may move towards the salt if $D_{dp} > 0$ (salt-attracting configuration), or be repelled by the salt otherwise. Abécassis *et al.* (Nature mat., 2008) show that in a Ψ -shaped channel diffusiophoresis behaves like diffusion, while we study the case when particles and salt are released together in a mixing flow, with mixing efficiency delayed in the salt-attracting configuration, and enhanced in the salt-repelling case. We show that diffusiophoresis is not diffusion-like but rather a purely compressible mechanism. Using analytical and theoretical considerations together with numerical simulations.

Keywords: Diffusiophoresis, mixing, chaotic advection, transport

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