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Mass transfer to freely suspended particles[1] JOHN LAWSON, Univ of Southampton — When small, rigid particles are suspended in a fluid, they slip, tumble and spin relative to the fluid. Simultaneously, material may be transferred from the surface by convection and diffusion. Practical examples include nutrient uptake by planktonic osmotrophs and the growth of crystals in agitated suspension. We present a generalised, theoretical approach to determine the mass transfer rate from small, ellipsoidal particles at large Peclet numbers. The approach accounts for preferential alignment between the particle and the surrounding flow field as well as its geometry. We complement these predictions with numerical simulations of scalar transport from small particles embedded in steady and turbulent flows. The results show that shape plays a significant role in the optimisation of transport from the surface of the particle. Our findings pave the way for simplified numerical models and experimental measurements of scalar transport from small particles with complex geometries.

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