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Turbulence Effects on Mass Transfer with Diffusion-Controlled Reaction[1] DIMITRIOS PAPAVASSILIOU, KIEN NGUYEN, The University of Oklahoma — Lagrangian numerical methods are used to examine flow effects on turbulent mass transfer with a chemical reaction. A DNS is used to describe turbulent flow in a channel and the mass transfer is simulated by releasing a large number of reactant particles distributed randomly over a cross section of the channel. In each simulation time step, the reactant particles move due to convection (obtained by the DNS), and due to diffusion (simulated by Brownian motion that depends on the Schmidt number). The reaction is such that the reactant transforms into a product when it comes in contact with the wall, i.e., it is a diffusion-controlled reaction. The reaction rate is related to the probability that a particle colliding with the wall will react. Using this methodology, the concentration profile and the mass transfer coefficient to the wall are calculated as a function of the channel length. The paper will discuss the effects of the flow and of the Schmidt number on the effective reaction rate and on the mass transfer coefficient, as well as the entry effects on the rate of mass transfer.

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