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Mass transfer in thin films under counter-current gas: experiments and numerical study MATHIEU LUCQUIAUD, GIANLUCA LAVALLE, PATRICK SCHMIDT, The University of Edinburgh, ILJA AUSNER, MARC WEHRLI, Sulzer Chemtech Ltd, LENNON O NARAIGH, University College Dublin, PRASHANT VALLURI, The University of Edinburgh — Mass transfer in liquid-gas stratified flows is strongly affected by the waviness of the interface. For reactive flows, the chemical reactions occurring at the liquid-gas interface also influence the mass transfer rate. This is encountered in several technological applications, such as absorption units for carbon capture. We investigate the absorption rate of carbon dioxide in a liquid solution. The experimental set-up consists of a vertical channel where a falling film is sheared by a counter-current gas flow. We measure the absorption occurring at different flow conditions, by changing the liquid solution, the liquid flow rate and the gas composition. With the aim to support the experimental results with numerical simulations, we implement in our level-set flow solver a novel module for mass transfer taking into account a variant of the ghost-fluid formalism. We firstly validate the pure mass transfer case with and without hydrodynamics by comparing the species concentration in the bulk flow to the analytical solution. In a final stage, we analyse the absorption rate in reactive flows, and try to reproduce the experimental results by means of numerical simulations to explore the active role of the waves at the interface.

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