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Reactive mixing in a shear flow EMILIE GUILBERT, CHRISTOPHE ALMARCHA, Aix Marseille University, HENRI LHUISSIER, BLOEN METZGER, CNRS, EMMANUEL VILLERMAUX, Aix Marseille University — We investigate the interaction between chemical reaction and diffusion on a moving substrate and by means of an original chemical reaction between two transparent reactants (fluorescin and potassium ferricyanide) which produce a fluorescent product in water (fluorescein) with tunable kinetics. A blob of fluorescin in a cell filled with potassium ferricyanide is advected in a simple shear flow. The blob deforms into an elongated strip diffusing from its borders at a shear-dependent rate. Depending on the ratio of the mixing time to the reaction time (Damkhöler number Da), several regimes are identified: When $Da > 1$, the product concentration remains constant in the reaction zones until the reactive borders overlap, while when $Da < 1$ the product concentration increases linearly in time at a rate controlled by the reaction only. The mixing-controlled decay rate of the final product concentration after the reaction is completed is described as well.

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