

M. J. B. Hauser, D. Lebender, F. W. Schneider:
Stirring Sense in a Chemical Reactor
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Abstract:

The effect of the stirring rate and stirring sense on the bifurcation points of the oscillatory domain of the minimal bromate system in a stirred flow reactor is studied experimentally and computationally using non-premixed feedstreams. Stirring below ~ 1000 rpm shifts both the "lower" (supercritical) and the "upper" (subcritical) Hopf bifurcations to higher values of the flow rate as the stirring rate is decreased. The position of the Hopf bifurcations as well as the size of the oscillatory domain were also affected when the feedstreams were permuted or, alternatively, when the direction of stirring was reversed. The positions of the Hopf bifurcations were no longer affected at high stirring rates ($> \sim 1000$ rpm), but they showed different limiting values depending on which in-flow configurations or stirring sense was used. This behavior is confirmed by a phenomenological stirring model that assumes the presence of small subvolumes in the immediate vicinity of the entry ports. The stirring sense is introduced in the model by an inequality in the mass exchange rates between the subvolumes.