

Electronic Supplementary Information Description:

Video 1: Initial conditions: inner, $[\text{Hg}^{2+}]_0 = 0.23 \text{ M}$ in 1% per volume agar gel, outer, $[\text{I}^-]_0 = 4.0 \text{ M}$. Displays the evolution and formation of a spiral wave accompanied by the process of breakup leading to defect-mediated chemical turbulence.

Video 2: Initial conditions: inner, $[\text{Hg}^{2+}]_0 = 0.26 \text{ M}$ in 1% per volume agar gel, outer, $[\text{I}^-]_0 = 3.0 \text{ M}$. Displays the evolution and formation of a circular wave (target) accompanied by the process of breakup leading to defect-mediated chemical turbulence.

All the videos are prepared by compiling a series of consecutive frames captured at 5-second intervals. In the videos the frames are set to appear for 0.2 seconds, which implies that the videos do not reflect real time evolution.