Pattern of Reaction Diffusion Fronts in Laminar Flows

[illegible]
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[illegible] [1] [illegible] [2,3] [illegible] [4] [illegible] [5,6] [illegible] [2] [illegible] [3] [illegible] [1,4,7] [illegible] [1,8] [illegible] [1] [illegible] [11] [illegible] 2D [illegible] b. [illegible] z [illegible] $\vec{U} = U_M(1-\zeta^2)\vec{z}$ [illegible] $U_M = 1.5\overline{U}$ [illegible] $\overline{U}$ [illegible] $\zeta = 2x/b$ [illegible] $\vec{z}$ [illegible] [1,5,6]

$$\frac{\partial C}{\partial t} + \vec{U}\cdot\vec{\nabla}C = D_m \triangle C + \alpha C^2(1-C), \tag{1}$$

[illegible] C [illegible] D_m [illegible] α [illegible] $\vec{U} = \vec{0}$), Eq. (1) [illegible] $V_0 = \sqrt{\alpha D_m/2}$ [illegible] $L_0 = D_m/V_0$ [5,6]. [illegible]

[illegible] Eq. (1) [illegible] $\eta = b/2L_0$ [illegible] $\varepsilon = \overline{U}/V_0$. [illegible] [11] [illegible] Eq. (1), [illegible] $v = V_F/V_0$, [illegible] ε, [illegible] η. [illegible]

[illegible] ($\eta \to 0$ [illegible] $\varepsilon \to 0$), [illegible] $v = 1 + \varepsilon$. [illegible] $L_0 \gg b$, [illegible] $V_F = V_0 + \overline{U}$.

[illegible] ($\eta \gg 1$), [illegible] Eq. (1) [illegible]

$$\vec{V}_F\cdot\vec{n} = V_0 + \vec{U}\cdot\vec{n} + D_m\kappa, \tag{2}$$

[illegible] $\vec{n}$ [illegible] κ [illegible]

$$V_F = V_0/\cos\theta + U(\zeta), \tag{3}$$

[illegible] θ [illegible] $\vec{n}$ [illegible] $U(\zeta)$ [illegible] [11] [illegible] ($\varepsilon > 0$), $V_F = V_0 + U_M$, [illegible] Eq. (3). [illegible] ($\varepsilon < 0$), $V_F = V_0$, [illegible] $\theta = 0$ [illegible] $\zeta = \pm 1$), [illegible] θ [illegible] $\zeta = 0$). [illegible] $D_m\kappa$ [illegible] Eq. (2)] [illegible]

0031-9007/03/90(12)/128302(4)$20.00

[illegible] [9]. [illegible] 2D [illegible] b [illegible] [11] [illegible] a (in [illegible]) [illegible] $U_M = 2\overline{U}$ and $\zeta = r/a$) [illegible] 2D [illegible] [12] [illegible] (1) [illegible] 3D [illegible].

[illegible] [6,12]. [illegible] ($\vec{U} = \vec{0}$). [illegible] [5,6] [illegible] $V_0 \sim 0.02$ mm/s, [illegible] $L_0 = D_m/V_0 \sim 0.1$ mm ($D_m \sim 2.10^{-9}$ m^2/s). [illegible] $b \times W = 0.1 \times 1, 0.2 \times 4, 0.4 \times 8, 1 \times 15$ mm^2 and [illegible] $a = 0.3$, 0.58, 0.88, and 1.9 mm. [illegible] 10 and $\sim 60V_0$.

[illegible] 3D [illegible] x and y [13]. [illegible] W, [illegible] b, [illegible] [illegible] 4). [illegible] $W/b = 10$, 15, and 20, [illegible] [13] $U_M/\overline{U} = 1.60$, 1.57, and 1.55, [illegible] 1 [illegible]

[illegible] $\overline{U} = 0$). [illegible] [14]. [illegible] 1 [illegible] $\upsilon = V_F/V_0$ [illegible] $\varepsilon = \overline{U}/V_0$, [illegible] ($\eta$), [illegible] [11] [illegible] η. [illegible] ($1 < \eta < 6$), [illegible] 2D [illegible] $\eta \ll 1$). [illegible]

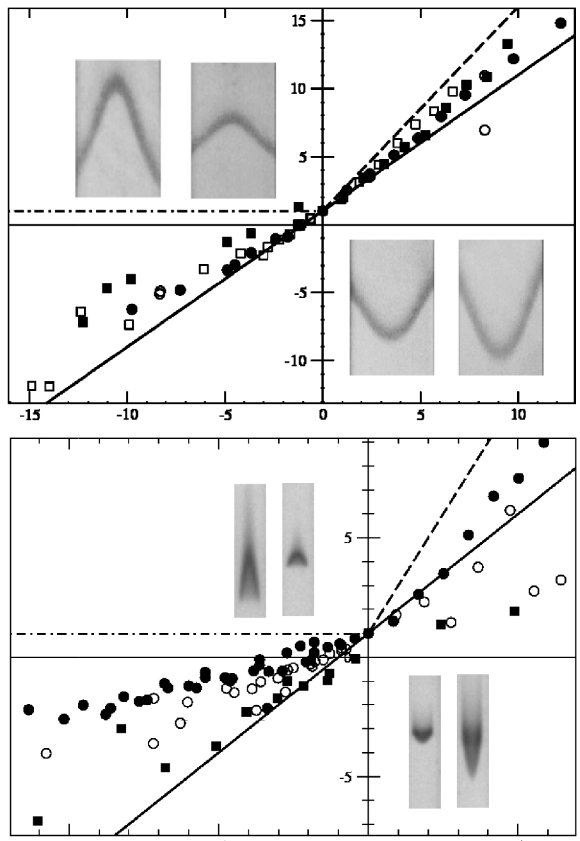
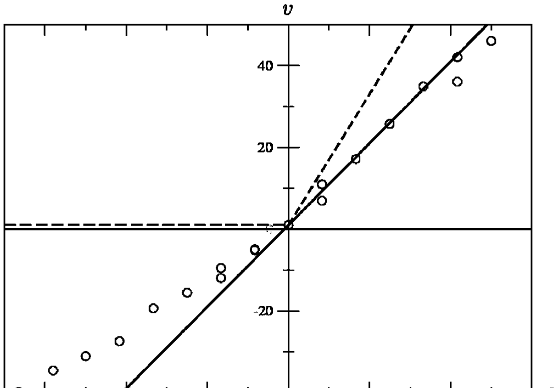


FIG. 1. [illegible] υ [illegible] ε ($\varepsilon < 0$: [illegible] $\varepsilon > 0$: [illegible]) [illegible] η. [illegible] ($\eta = b/2L_0, W/b$): ○ (0.5, 10); ● (1, 20); □ (2, 20); ■ (5, 15). [illegible] ($\eta = a/L_0$): ■ (3); ○ (5.8); ● (8.8). [illegible] ($\eta \to 0$) [illegible] ($\eta \to \infty$). [illegible] $\varepsilon = -4.8, -2.4, +2.4$, and $+4.8$ [illegible] ($\eta = 1$) and $\varepsilon = -6.7, -1.9, +1.9$, and $+6.7$ [illegible] ($\eta = 3$).

[illegible] [10] [illegible] $Pe = \overline{U}a/D_m = \varepsilon\eta$), [illegible] $Da = \alpha a/\overline{U} = 2\eta/\varepsilon$), [illegible] [10] [illegible] $Da \ll 1$ ([illegible] V_0 [illegible] [15] [illegible]

[illegible] $V_F = V_0$) [illegible] η [illegible] ε [illegible] η [illegible] [11] [illegible] ε [illegible] 50 [illegible] $\eta = 0.5$ [illegible] [illegible] 2) [illegible] 2D [illegible] [11] ($V_F = V_0 + \bar{U}$ [illegible] $\eta \to 0$). [illegible] [illegible] 1). [illegible] $\eta = b/2L_0$ [illegible] 2D [illegible] [11] [illegible] (0.5, 1, 2, 5), [illegible] $W/2L_0$ [illegible] (5, 20, 40, 75). [illegible] 3D [illegible] (2), [illegible]



[illegible] 2. [illegible] v [illegible] ε [illegible] $1 \times 0.1\ \mathrm{mm}^2$ ($\eta = 0.5,\ W/b = 10$). [illegible] $\eta \to 0$) [illegible] ($\eta \to \infty$) [illegible]

$$V_F = (V_0 + D_m\kappa)/\cos\theta + U^{2D}(y), \tag{4}$$

[illegible] $U^{2D}(y)$ [illegible] [13] [illegible] κ [illegible] 2D [illegible] $\varepsilon > 0$ [illegible] U_M^{2D} [illegible] $U^{2D}(y)$, [illegible] $\theta(y = 0) = 0$ [illegible] $\kappa(y = 0) = 0$] [illegible] $V_F = V_0 + U_M^{2D}$, [illegible] ($W/2L_0 \gg 1$) [illegible] $V_F = V_0 + \bar{U}$, [illegible] ($W/2L_0 \ll 1$). [illegible] ($W/b \to \infty$) [illegible] $U_M^{2D}/\overline{U} = 1.07$, 1.05, [illegible] 1.03 [illegible] $\eta = b/2L_0$ [illegible] 2D [illegible] [11] [illegible] 3D [illegible]

[illegible] (1) [illegible] (4), [illegible] (1), [illegible] [11] [illegible] (2D [illegible] [16] [illegible] 3D [illegible] (1) [illegible] 2D [illegible] (4) [illegible] 3D [illegible] [13] [illegible] $U^{2D}(y)$. [illegible] $C = 0.5$ [illegible] 3 [illegible] (ε, η, W/L_0) [illegible] ($\varepsilon = -4.8$) [illegible] ($\varepsilon = +4.8$) [illegible] W/L_0 [illegible] (4) [illegible] κ [illegible] (4) [illegible] (4) [illegible] W), [illegible]

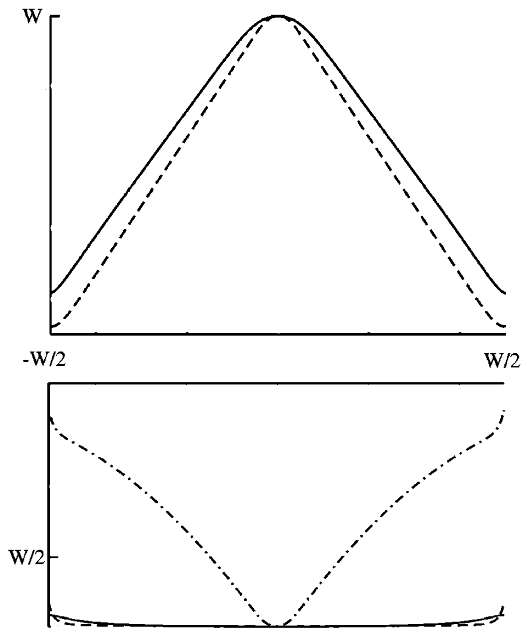


FIG. 3. [illegible] (4) [illegible] $\eta = 1$ [illegible] $\varepsilon = -4.8$) [illegible] $\varepsilon = 4.8$). [illegible] $V_f/V_0 = -3.3$ [illegible] 6.16, [illegible] 2D [illegible] 2%) [illegible]

[illegible] $U^{2D}(y)$ [illegible] (3). [illegible]

[illegible] 4 [illegible] $C = 0.5$, [illegible] θ [illegible] b [illegible] W [illegible] θ) [illegible] θ. [illegible] $\eta = b/2L_0$ [illegible] $W/b \gg 1$).

[illegible]

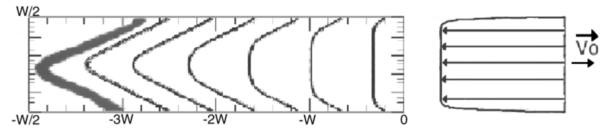


FIG. 4. [illegible] 3D [illegible] $\eta = 1$ [illegible] $\varepsilon = -3.3$. [illegible]

[illegible] 2D [illegible] [11] [illegible] $\eta \ll 1$) [illegible] $\eta \gg 1$). [illegible]

[illegible] (N[illegible]024052), [illegible] 79/[illegible]00/8368, [illegible]083), [illegible] (N[illegible]). [illegible]

[1] S. K[illegible], *Oscillations, Waves, and Chaos in Chemical Kinetics* ([illegible] 19[illegible]).
[2] [illegible] **7**, 355 (19[illegible]7).
[3] [illegible] **1**, 1 (19[illegible]7) [illegible]
[4] [illegible] **9**, 341 (19[illegible]8).
[5] [illegible] **104**, 3838 (19[illegible]2).
[6] [illegible] **85**, 2506 (2000).
[7] [illegible] **146D**, 1 (2000).
[8] [illegible] **11**, 1 (19[illegible]5).
[9] [illegible] **328**, 255 (2000).
[10] [illegible] **64**, 046307 (2001).
[11] [illegible] **89**, 104501 (2002).
[12] [illegible] **65**, 051605 (2002).
[13] [illegible] **9**, 1841 (19[illegible]).
[14] [illegible] **29**, 1523 (19[illegible]).
[15] [illegible] **219**, 186 (19[illegible]3).
[16] [illegible] **338**, 277 (19[illegible]).