Simulation BGK d'écoulements de fluides miscibles visqueux, denses et réactifs

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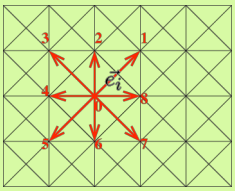


Equation de relaxation

$$N_i(\vec{x}+\vec{e}_i,t+1) = (1-\omega)N_i(\vec{x},t) + \omega N_i^e(\vec{x},t)$$

$$N_i^e(\vec{x},t) = t_i\rho\left\{1+\sum_{\alpha,\beta}\left[\frac{e_{i\alpha}u_\alpha}{c_s^2}+\frac{u_\alpha u_\beta}{2c_s^2}\left(\frac{e_{i\alpha}e_{i\beta}}{c_s^2}-\delta_{\alpha\beta}\right)\right]\right\}$$

Densité :

$$\rho(\vec{x},t) = \sum_{i=0}^{8} N_i(\vec{x},t)$$

Quantité de mouvement :

$$\rho\vec{u}(\vec{x},t) = \sum_{i=0}^{8} N_i(\vec{x},t)\vec{e}_i$$

Viscosité :

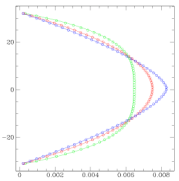
$$\nu = \frac{1}{6}\left(\frac{2}{\omega}-1\right)$$

Navier-Stokes

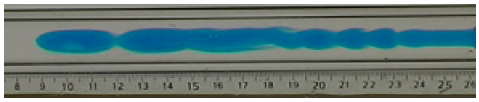
$$\rho\left(\frac{\partial\vec{q}}{\partial t}+\vec{q}.\vec{\nabla}\vec{q}\right) = -\vec{\nabla}P+\eta\Delta\vec{q}-\frac{\eta}{K}\vec{q}+\Delta\rho'\vec{g}$$

Equation de convection diffusion

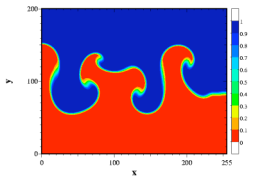
$$\frac{\partial C}{\partial t}+\vec{q}.\vec{\nabla}C = D_0\Delta C+f(C)$$



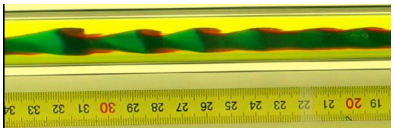
Ecoulement de fluides non-newtonien



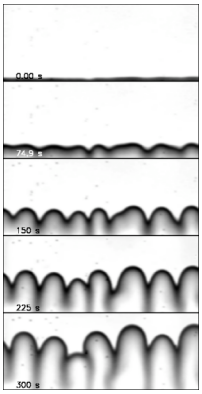
Ecoulements de 2 fluides miscibles entre deux plaques

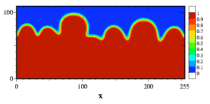


Instabilité de Rayleigh Taylor

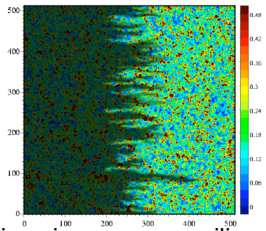


Ecoulements de 3 fluides miscibles entre deux plaques

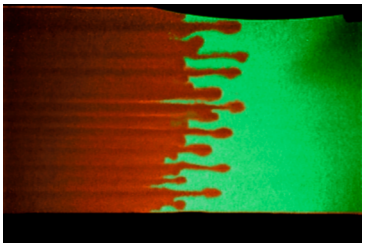


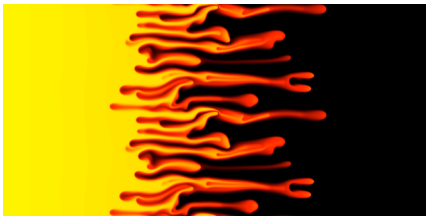


Instabilité de Rayleigh Taylor sur front de réaction chimique auto-catalytique



Digitation visqueuse en milieux poreux hétérogène





Digitation visqueuse en milieu poreux homogène