Transport phenomena in chaotic flows: flux recombination HEX reactors

Submitted by Thierry Lemenand on Tue, 03/17/2015 - 11:47

Titre	Transport phenomena in chaotic flows: flux recombination HEX reactors
Type de publication	Communication
Type	Communication avec actes dans un congrès
Année	2012
Langue	Anglais
Date du colloque	8-12/07/2012
Titre du colloque	ASME-ICNMM 2012: 1Oth International Conference on Nanochannels, Microchannels and Minichannels, Symposium on Mass Transfer
Pagination	8
Auteur	Ghanem, Akram [1], Lemenand, Thierry [2], Della Valle, Dominique [3], Peerhossaini, Hassan [4]
Pays	Etats-Unis
Editeur	ASME (American Society of Mechanical Engineers)
Ville	Puerto Rico
Mots-clés	chaotic advection [5], Chemical probe method [6], Experimental procedure [7], Flux recombination HEX reactor [8], Industrial processes [9], Iodide-iodate [10], Mass transfer [11], mixing [12]
Résumé en anglais	Rapid transport of heat and mass is required in many industrial processes. Mixing is a fundamental issue in chemical engineering applications and when exothermic reactions are involved, heat transfer capabilities of reactors and static mixers become an advantage and a necessity to ensure stable operating conditions and security standards. Enhancement of mixing and heat exchange is possible through turbulence, but vortical structures are often not feasible for highly viscous, non-Newtonian or shear sensitive fluids such as emulsions, pastes and slurries common in pharmaceutical, cosmetic and food industries. An alternative to improve transport within such materials is chaotic advection, where Lagrangian chaotic structures are induced by physical means in low-Reynolds laminar flows. Microfluidics is an increasingly active domain in which small dimensions and velocities render turbulent mixing extremely hard. Mixing by diffusion is one solution where topological mixing schemes exploiting the laminarity the flow to repeatedly fold the flow and exponentially increase the concentration gradients to obtain fast and efficient mixing by diffusion. This paper presents the first results of a study investigating laminar and turbulent mixing qualities of a Flux Recombination Hex reactor by using the chemical probe method. The geometry, exploiting a three-dimensional, steady flow configuration intended to mimic the baker's map and enhance mixing by chaotic advection. First proposed by Chen & Meiners [1] for a microfluidic chip, it is here reproduced for investigation purposes using a stratified multiple plate manufacturing technique on a mini-scale where laminar and slightly turbulent regimes can be assessed.

URL de la notice	http://okina.univ-angers.fr/publications/ua8901 [13]

Liens
[1] http://okina.univ-angers.fr/publications?f[author]=15369
[2] http://okina.univ-angers.fr/t.lemenand/publications
[3] http://okina.univ-angers.fr/publications?f[author]=15326
[4] http://okina.univ-angers.fr/publications?f[author]=15328
[5] http://okina.univ-angers.fr/publications?f[keyword]=14272
[6] http://okina.univ-angers.fr/publications?f[keyword]=14566
[7] http://okina.univ-angers.fr/publications?f[keyword]=14570
[8] http://okina.univ-angers.fr/publications?f[keyword]=14575
[9] http://okina.univ-angers.fr/publications?f[keyword]=14576
[10] http://okina.univ-angers.fr/publications?f[keyword]=14567
[11] http://okina.univ-angers.fr/publications?f[keyword]=14342
[12] http://okina.univ-angers.fr/publications?f[keyword]=5762
[13] http://okina.univ-angers.fr/publications/ua8901