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Supplementary Information for Finding the optimal design of a passive microfluidic mixer

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1 Description of supplementary files

1.1 Video files

- s1.mp4 is the concentration profiles of 0 to 200 generations of NSGA-II mixer designs.
- s2.mp4 is the pressure profiles of 0 to 200 generations of NSGA-II mixer designs.
- s3.mp4 is the velocity magnitude profiles of 0 to 200 generations of NSGA-II mixer designs.

1.2 Code to generate random mixer designs

The file code.7z contains the MATLAB script we used to generate 6069 random mixer designs. Program entrance

Functions for building geometries CreateCycle.mCreate a cycle CreatePolygon.m Create a polygon CreateRectangle.mCreate a rectangle CreateDifference.m Boolean operation to create a difference between two geometries CreateUnionWithoutInput.m Boolean operation to create a union from several geometries Functions for simulations modelCreateFirstStep.m A few lines of script to process at the beginning AddLaminarFlow.m Add the Laminar Flow physics _AddTransportOfDilutedSpecies.m . Add the Transport Of Diluted Species physics AddWaterAsMaterials.mAdd water as main material for geometry CreateTriMesh.mCreate the triangular mesh for the geometry StudyOneForLaminar.mCalculate the velocity field _StudyTwoForTransportOfDilutedSpecies.m ... Calculate the concentration profile Others getBoundaryNumber.m get the number of inlet/outlet boundary getPressureData.m get the pressure data

1.3 Guideline to implement NSGA-II for specific applications

We used a NSGA-II package implemented in MATLAB from github.com. The homepage of this package is *https://github.com/chudur-budur/nsga2-matlab*. This package has included most functionality we need to use to optimizing the mixer designs or other applications, such as genetic operators, sorter, checking dominance and etc. The major part we need to customize is adding the simulation part (described above) into the main program. Please find the description of the specific functions we used from this package.

Descriptions of files in the package

nsga2.m	The entrance of program
selection.m	
real-cross.m	Cross operator
real-mutate.m	Mutate operator
mutation-pop.m	Mutate population
fill-nondominated-sort.m	Sorting operator
evaluate-pop.mEva	luate the performance with fitness functions.
check-dominance.m	Check dominance or not