SILICON-ON-CHIP

Nikolas Gaio
TU DELFT EMPOWERS BIOLOGIST BY PROVIDING THEM HARDWARE FOR THE DEVELOPMENT OF OOC MODELS
OOC DESIGNED BY BIOLOGISTS FOR BIOLOGISTS
OOC DESIGNED BY ENGINEERS FOR BIOLOGISTS
ENGINEERS GOALS

EASE-OF-USE  REPRODUCIBILITY  FUNCTIONALITIES  SENSORS  SCALE-UP

SILICON MICROFABRICATION
STRETCHABLE POROUS MEMBRANES

STRETCHABLE MICROELECTRODE ARRAYS

MICROFLUIDIC DEVICES
POROUS and STRETCHABLE MEMBRANES

SMALL FEATURES
HIGH POROSITY
THIN LAYERS

https://wyss.harvard.edu/technology/human-organs-on-chips/
POROUS and STRETCHABLE MEMBRANES

2 YEARS OF OPTIMIZATION

EASY TO HANDLE

QUICK TO FABRICATE

COSTUMIZABLE

Porosity Achieved: > 50 %
30% HIGHER THAN PREVIOUS WORK

Minimum Feature: 2 μm
50 % SMALLER THAN PREVIOUS WORK
Microfabricated tuneable and transferable porous PDMS membranes for Organs-on-Chips

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We present a novel and highly reproducible process to fabricate transferable porous PDMS membranes for PDMS-based Organs-on-Chips (OOCs) using microelectromechanical systems (MEMS) fabrication technologies. Porous PDMS membranes with pore sizes down to 2.0 μm in diameter and a wide porosity range (2–65%) can be fabricated. To overcome issues normally faced when using replica moulding and extend the applicability to most OOCs and improve their scalability and reproducibility, the process includes a sacrificial layer to easily transfer the membranes from a silicon carrier to any desired substrate.
STRETCHABLE MEA

MECHANICAL STIMULATION

ELECTRICAL MONITORING

CYTOSTRETCH DEVICE
CYTOSTRETCH DEVICE

STRETCHABLE CELL CULTURE ENVIRONMENT

STANDARD MEA (MULTICHLANNEL SYSTEM)

EASY TO USE
BI/OND

The Versatile Organ-on-Chip Platform
OPEN WELL FORMAT

2D AND 3D CELL CULTURES

2D AND 3D CELL CULTURES
CONCLUSIONS

OOC developed by engineers for biologists

HIGHLY POROUS MEMBRANE
EASY TO USE STRETCHABLE MEA
MICROFLUIDIC DEVICES FOR 3D CELL CULTURES
“Having a good mission is not enough. You need a concrete objective and you need to know how you’re going to get there.”

Bill Gates
Thank you!

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