Clark School Engineering Solutions for COVID-19

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Relevant Expertise:

- Microfluidic bioseparations and diagnostics
- MEMS-based chemical and biological sensors
- Additive manufacturing at the micro/nano scale

Website:
Maryland MEMS and Microfluidics Lab
http://mml.umd.edu

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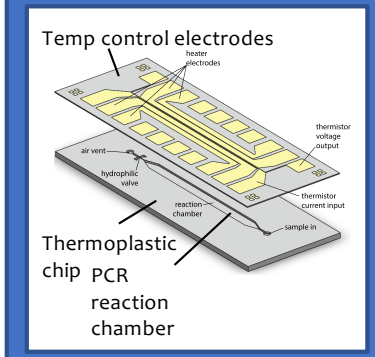
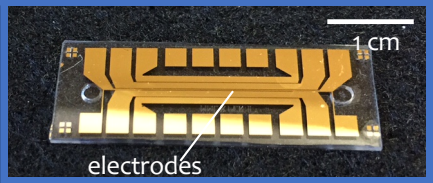
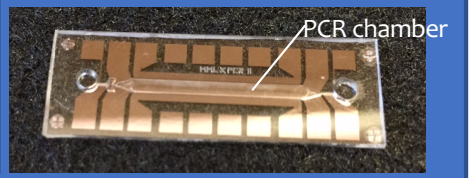
MEMS & Microfluidics Laboratory

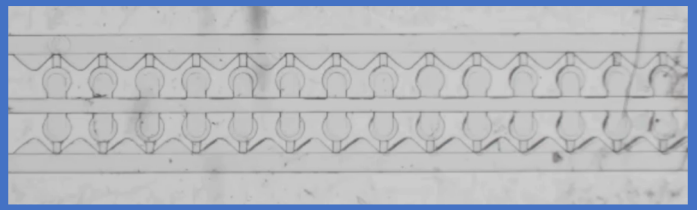
Reagent Integration for Disposable qRT-PCR SARS-CoV-2 Assays

- $15 assays in under 15 min for screening of active COVID-19 infection
- Portable reader on a USB stick with automated operation
- RT-PCR reagents integrated during chip manufacture
- Targets multiple SARS-CoV-2 RNA sequences in parallel

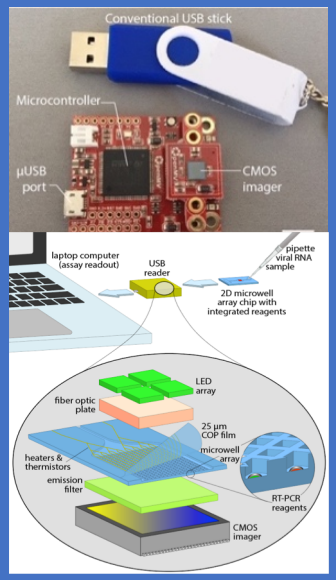






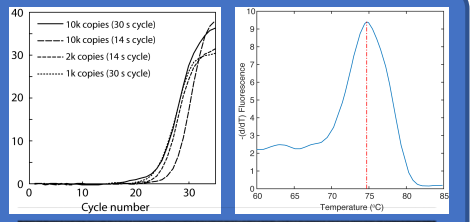


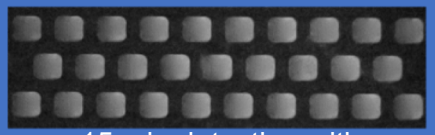
Disposable plastic chips with automated sample discretization



USB stick reader with integrated imager

Integrated PCR reagents with controlled release





<15 min detection with PCR product validation

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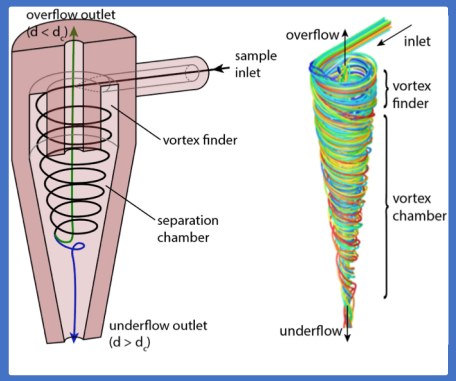
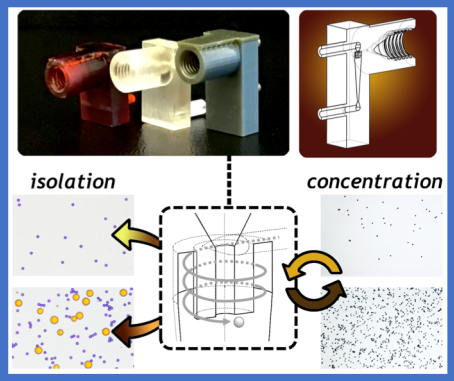
MEMS & Microfluidics Laboratory

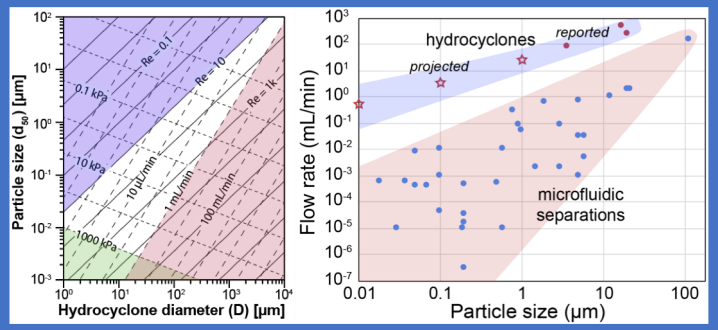
Microcyclones for Bioaerosol Fractionation

- Goal: evaluate SARS-CoV-2 distribution in environmental and exhaled breath aerosols
- Cyclones enable continuous-flow aerosol separations (0.2-10 µm)
- Fabricated by high resolution 3D printing (SLA-DLP & DLW/2PP)

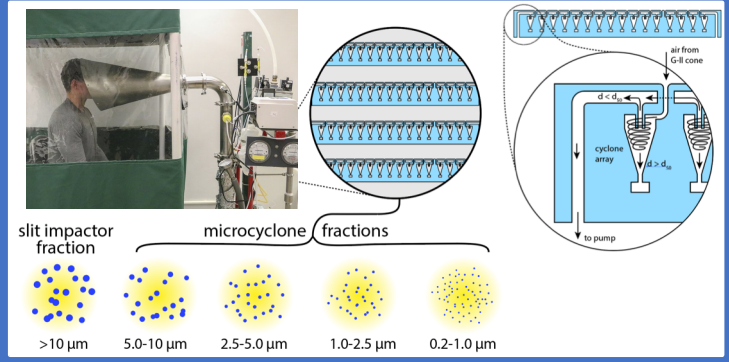




Size-dependent particle trajectories due to inertia, buoyancy, and drag force



Cyclone scaling enables <100 nm particle isolation



Monolithic cyclone arrays for high throughout (150 L/min) aerosol collection