

Innovating Fuel Technology through Microfluidic Devices

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Renewables are the Future!

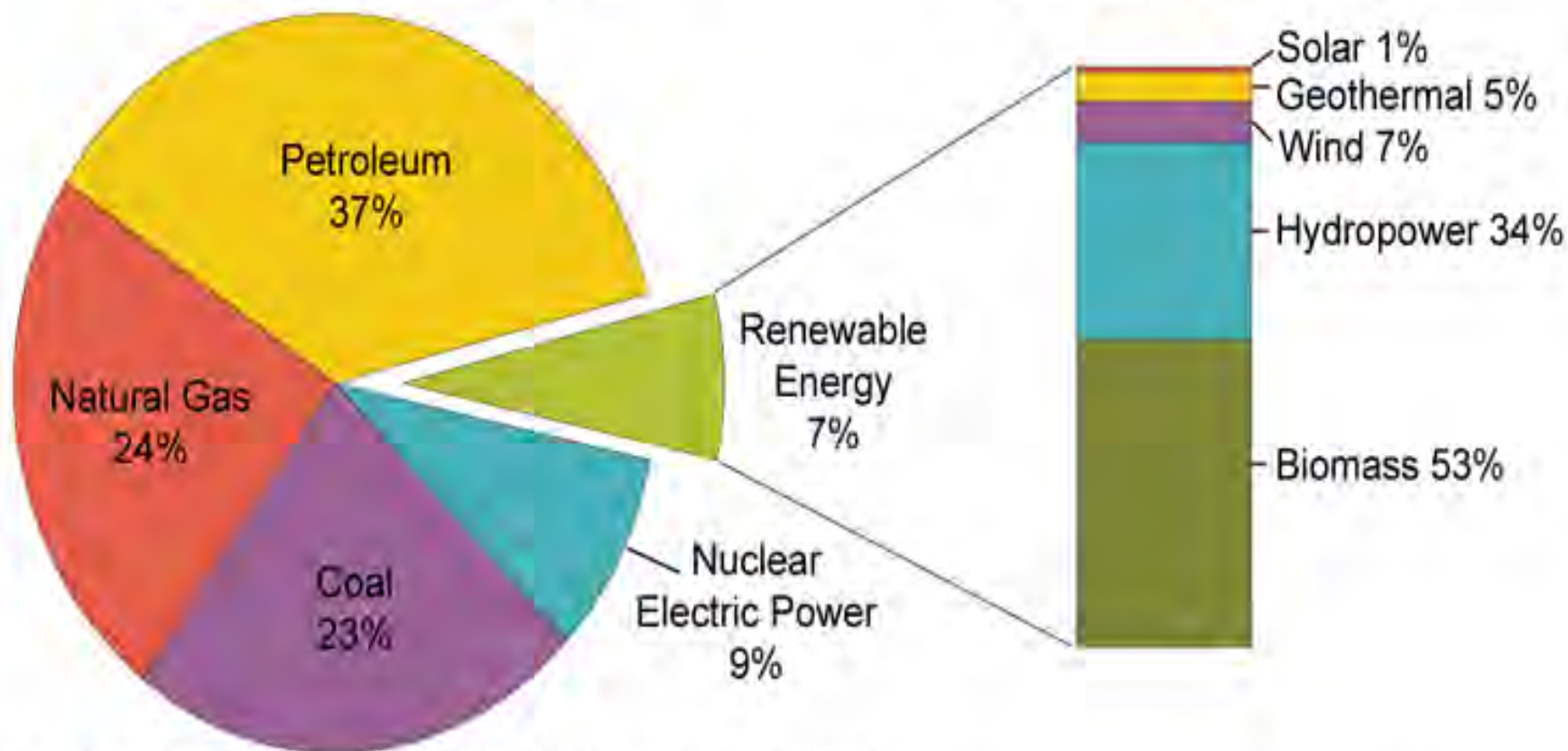


Courtesy of The National Renewable Energy Laboratory (NREL)

The Role of Renewable Energy in the Nation's Energy Supply, 2008

Total = 99.305 Quadrillion Btu

Total = 7.301 Quadrillion Btu



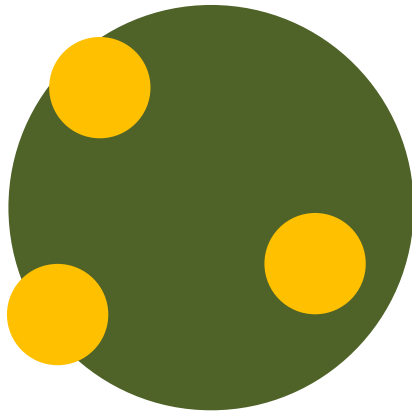
Note: Sum of components may not equal 100% due to independent rounding.

Source: Energy Information Administration, *Renewable Energy Consumption and Electricity Preliminary Statistics 2008*,

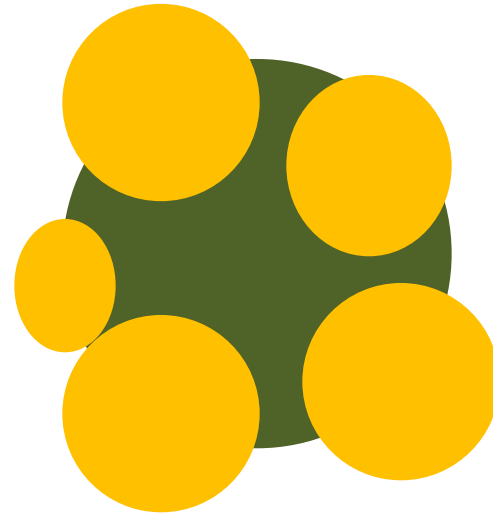
Table 1: U.S. Energy Consumption by Energy Source, 2004-2008 (July 2009).

Algae Cells

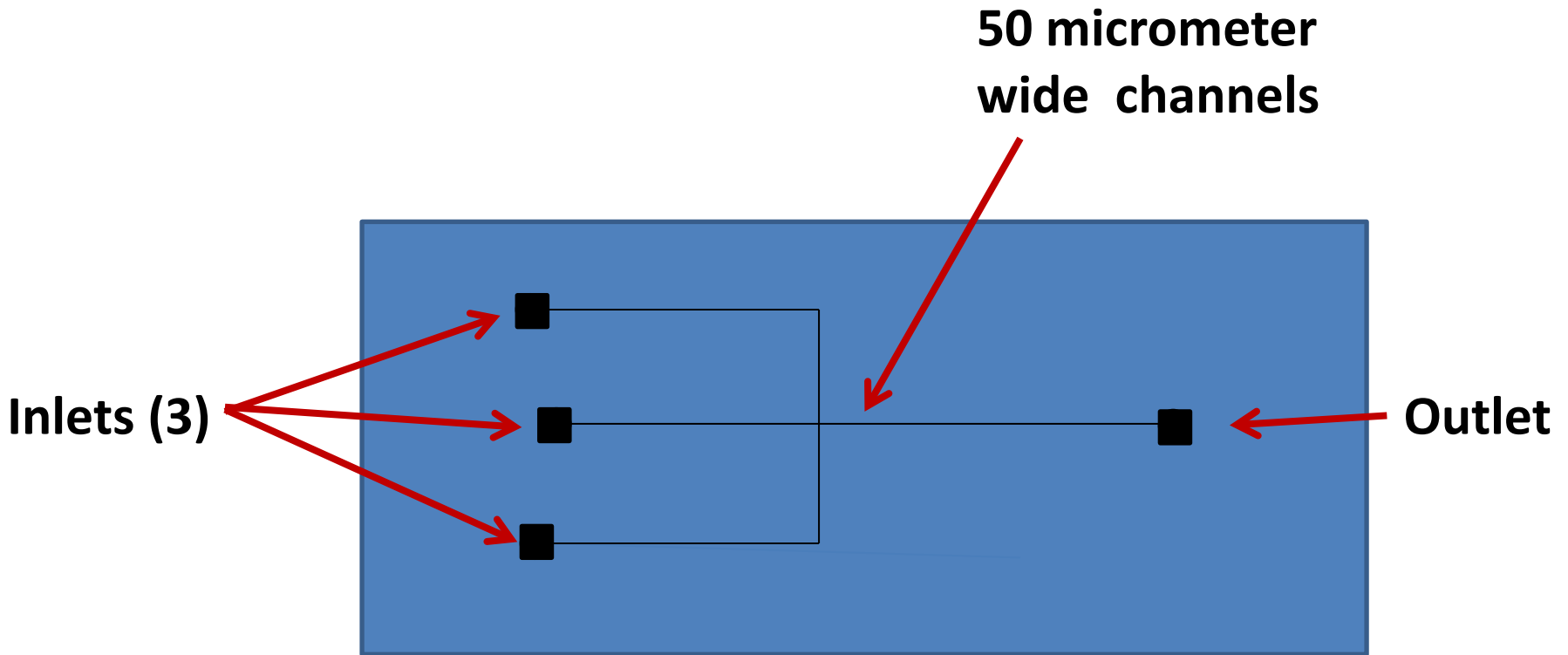
Low Lipid Concentration



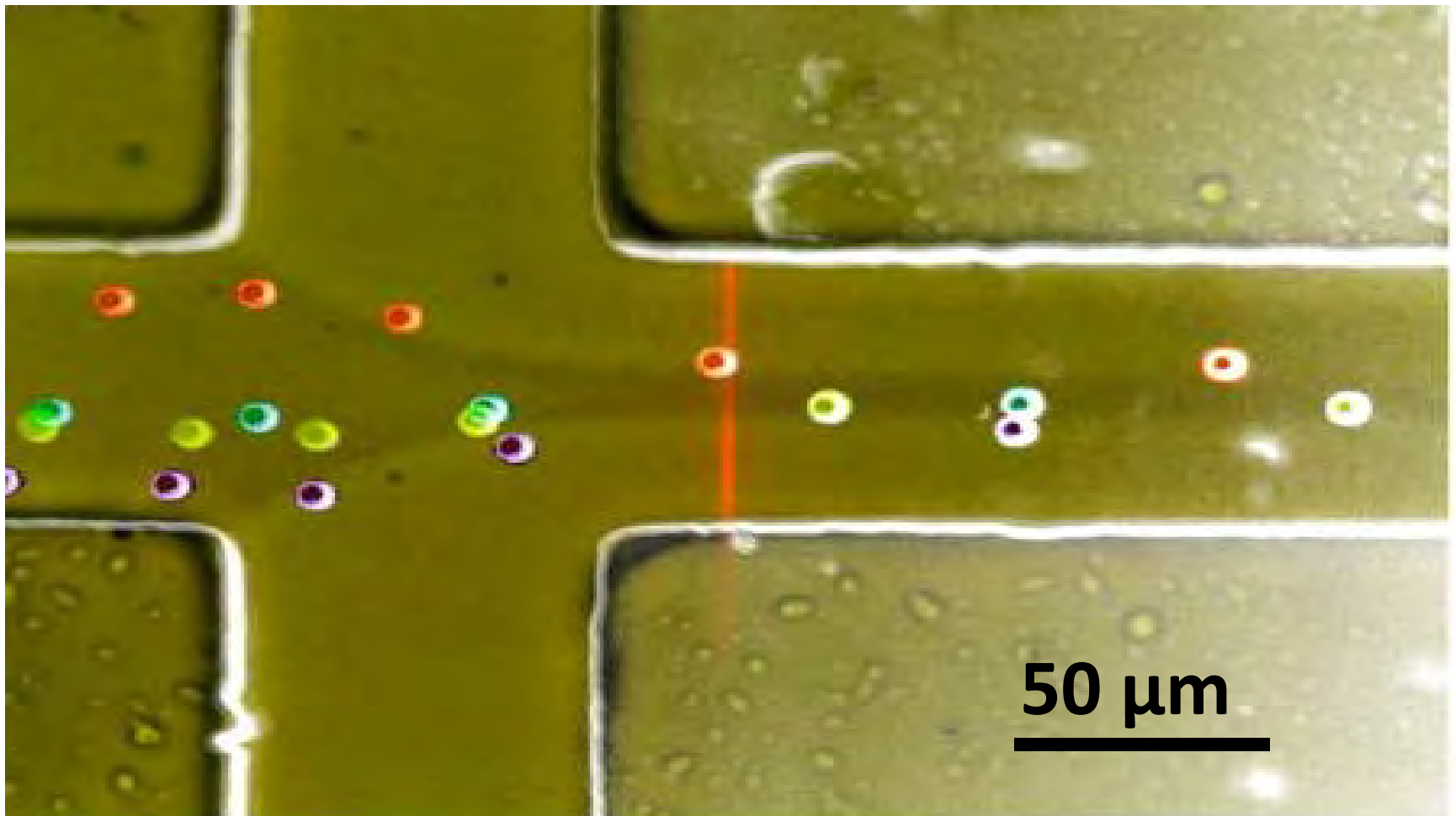
High Lipid Concentration



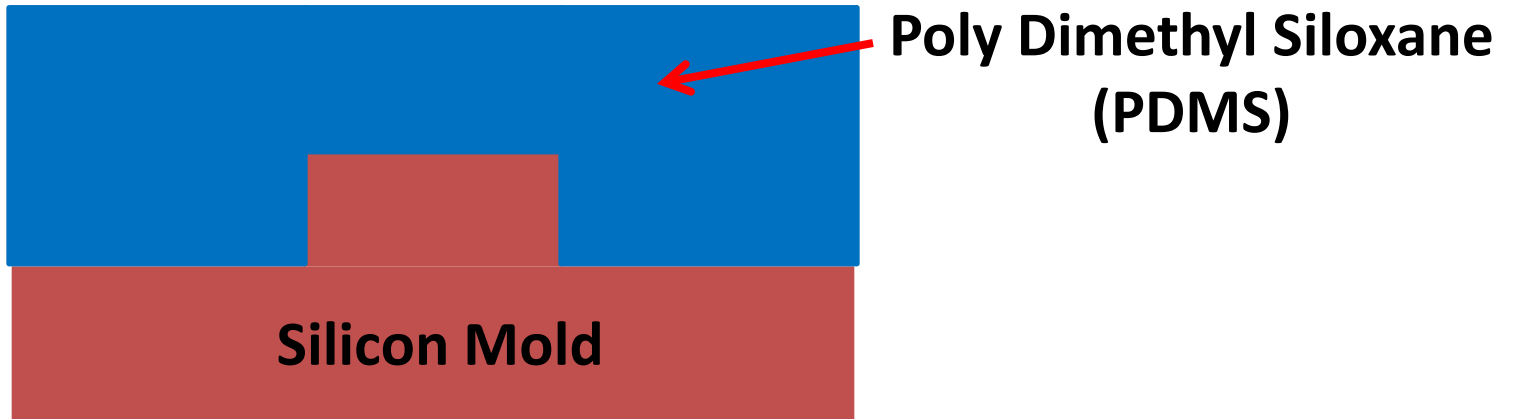
Top View of Microfluidics Device



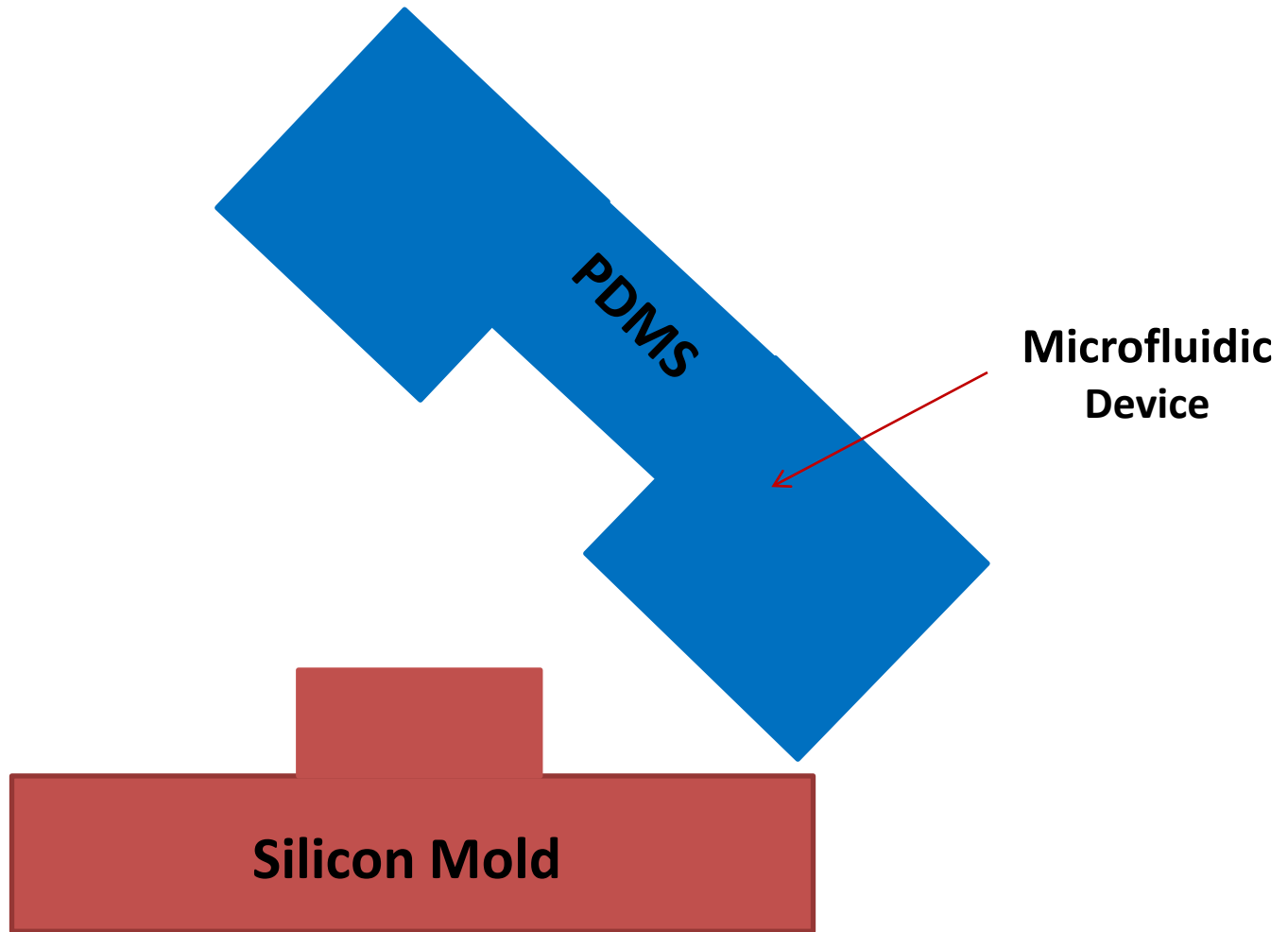
Efficiency of Microfluidics Device



Cross Sectional View of Fabrication

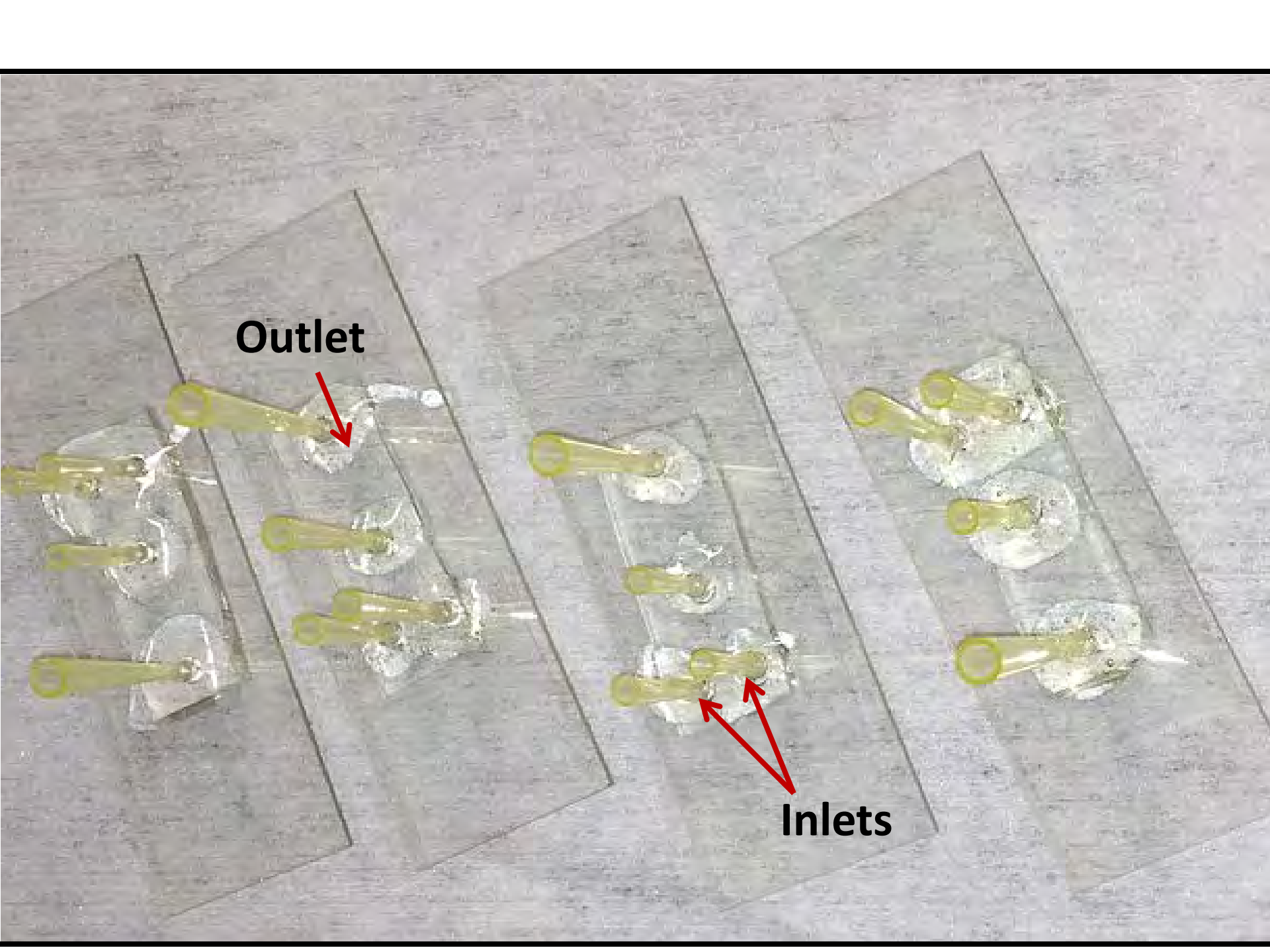


Cross-Sectional View of Fabrication



Cross-Sectional View of Fabrication



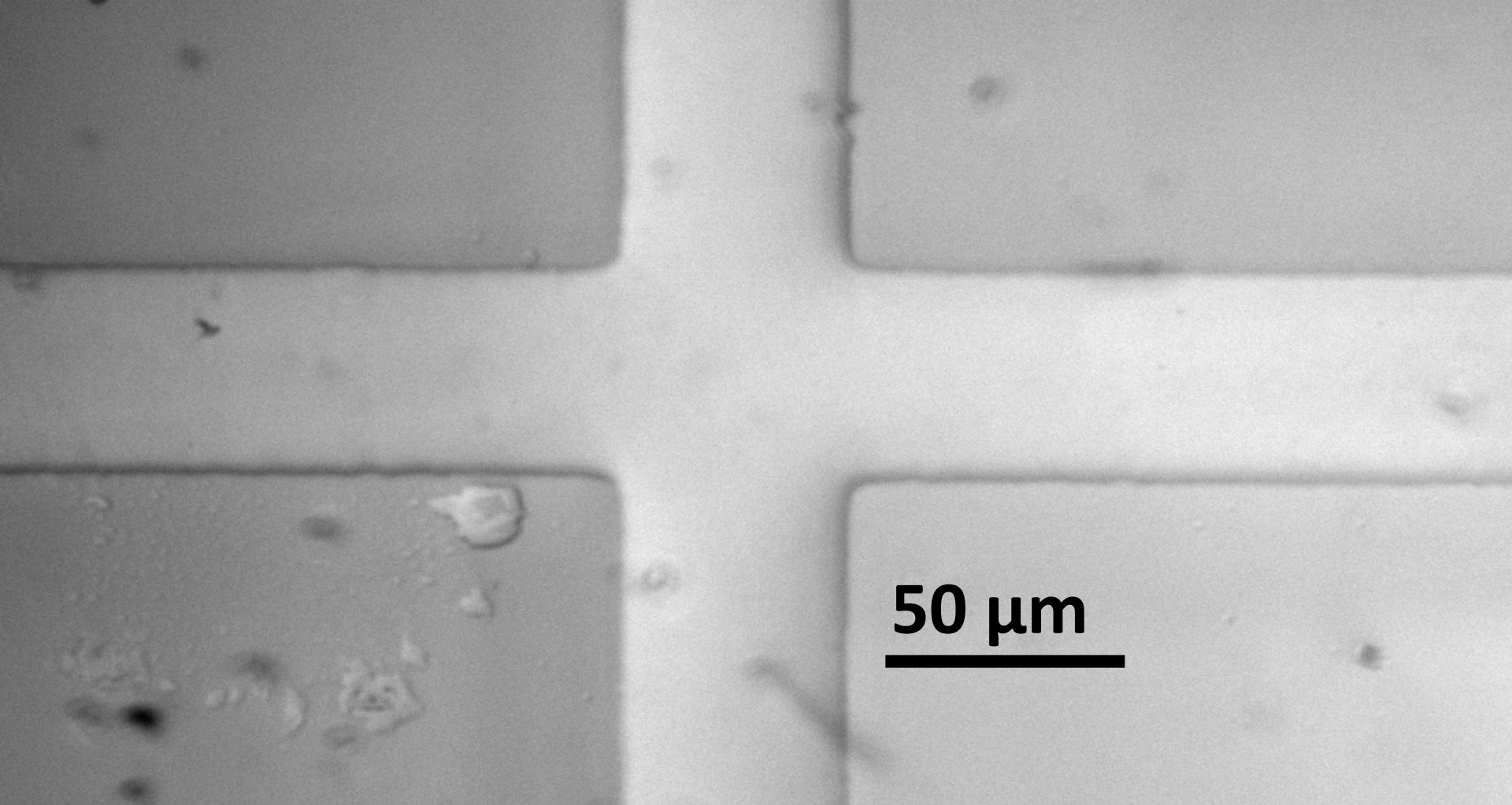


Outlet



Inlets





50 μm

Device #	Rate of beads in fluid (bead/ min)
Device #1 (Longer channels)	4.67 beads/min
Device #2 (Shorter channels)	14.0 beads/min

$$(L/2)^2 / t = D$$

$$(K_B T) / (D 6 \pi \eta) = r$$

molecule radius =
.56 nanometers

50 μm

A grayscale micrograph showing a cross-shaped channel structure. The channel consists of four arms meeting at a central point. The arms are dark, and the background is lighter. A white scale bar is located in the bottom right corner, labeled '50 μm'. The text 'molecule radius = .56 nanometers' is overlaid in the bottom left, and two equations are overlaid in the top left.

What we learned

Microfluidic devices help us in different applications.

- Provide a more efficient method of studying the making of biofuels, at a time when renewable sources are needed the most
- Aid in estimating the size of cells and even particles that are at the molecular level.

Acknowledgements

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