Laboratory for Energy and Microsystems Innovation

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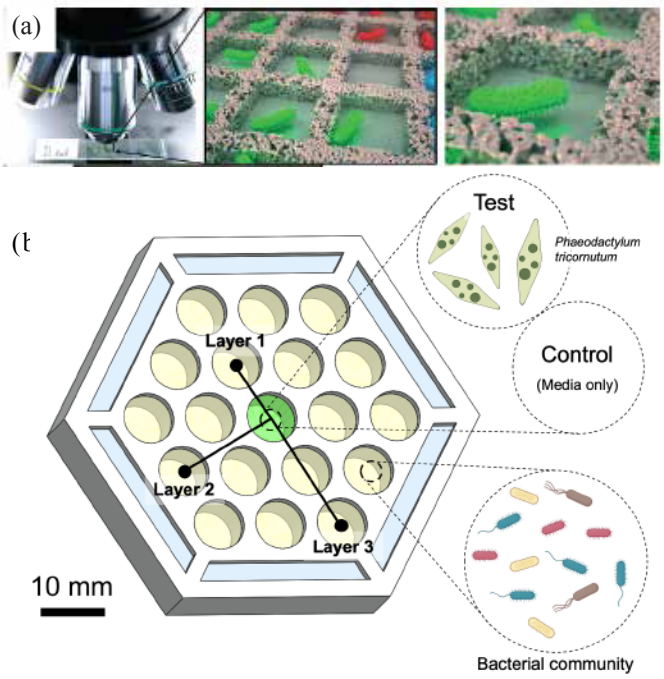
Microfluidic Tools for Microbiology

Nanoporous Microbial Platform to Study Algal-Bacterial Interactions for Biofuel Production

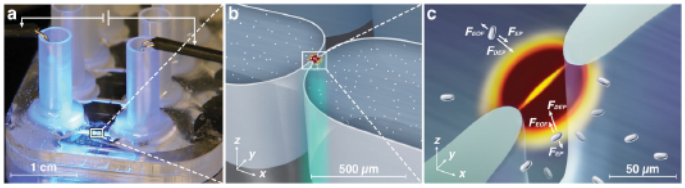
Abstract: We focus on understanding microbial consortia that are closely assiciated with bioenergy-relevant algal crops. We are developing a biocompatible platform that can controling diffusion of biomolecules exchanged between algae and bacterial communities.



Schematic and digital images of the nanoporous microbial platform. (a) Working principle of the co-culture platform. (b) Experimental design to incubate algae and bacterial communities in the nanoporous microbial platform.

Bacterial Electrophenotyping using High Sensitivity Dielectrophoresis

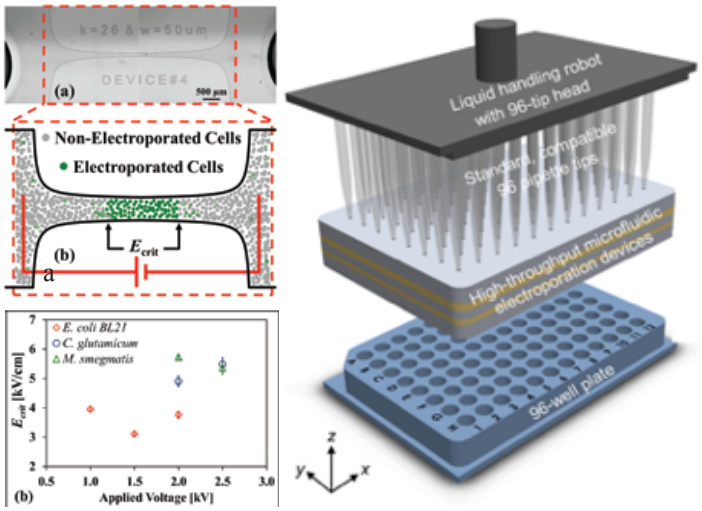
Abstract: In the work below, micro-milling is used to build devices with three-dimensional features. These three-dimensional insulator-based dielectrophoresis (3DiDEP) devices allow for trapping and characterization of bacteria at average electric fields one order of magnitude lower than previous designs (cont'd).[2,3]



(a) 3DiDEP microfluidic device with an array of multiple microchannels, its magnified view and schematic diagram to describe trapping bacteria with 3DiDEP principle.

Microfluidic Tools for High Efficiency Electroporation

Abstract: Current methods of genetic transformation of bacteria are slow and inaccessible for most organisms. We're designing microfluidic tools to broaden the range of bacteria amenable to genetic transformation for synthetic biology.



(Top) Microfluidic electroporation assay to rapidly determine electroporation conditions, the assay achieves an answer in less than 1 s. (Right) Automatic high-throughput electroporation platform for efficiently optimizing electroporation conditions.

LEMI Group Photo - May 2018

[1]Ge et al., Lab on a Chip, 2016
[2]Wang et al., Sci. Adv., 2019
[3]Braff et al., PLOS ONE, 2013
[4]Garcia et al., Scientific Reports, 2016
[5]Joung & Buie, Phys Rev E, 2014
[6]Joung & Buie, Nature Commun, 2015

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