

3D-Printable Scalable Internally-Wired Microfluidic Microbial Biofuel Cells

January 23, 2024 | 12:00–12:50 pm PST | MAE Auditorium, Building #255

Emil P. Kartalov, PhD

Associate Professor, Physics Department,
Naval Postgraduate School

Abstract

The future of naval operations is heavily dependent on the advent of effective drone fleets of surface and underwater capability. Such fleets would require frequent and local recharging, which poses a critical logistics problem. We are working on solving that problem through the development of renewable power sources using benthic bacteria. These sources are biofuel cells that harness the capability of such bacteria to output power as part of their life processes.

Biography

Emil Kartalov holds three degrees from California Institute of Technology (Caltech): a B.S. in Physics (1998), an M.S. in Applied Physics (2004), and a PhD in Applied Physics (2004). As an undergraduate in 1997, Emil helped discover two quasars by data digging in the Second Palomar Sky Survey, in Prof. George Djorgovski's group at Caltech. Starting in 1998, first as a researcher and later as a graduate student in Prof. Stephen Quake's biophysics group at Caltech, Emil developed microfluidic devices, single-molecule fluorescence microscopy methods, surface chemistry, and methods of DNA sequencing-by-synthesis.

Emil completed his postdoc at University of Southern California Keck School of Medicine where he developed microfluidic techniques and devices for applications in biomedical diagnostics, point-of-care diagnostics, and cancer research, as well as microfluidic methods and devices for sensors and actuators. In 2008, he became Assistant Professor at the University of Southern California Keck School of Medicine, where his research group continued the work on microfluidic techniques for biomedical diagnostics. In 2016, Dr. Kartalov moved to the Naval Postgraduate School to take a position as Associate Professor in the Physics Department, where his research group focuses on Navy-relevant applications of physics, such as artificial muscles, biofuel cells, and diver suits.

Emil has authored over 30 peer-reviewed publications and is an inventor on over 30 issued US patents, in a wide range of fields and applications, such as microfluidics, biotechnology, DNA sequencing-by-synthesis, bioassays, microfabrication, actuators, sensors, biomedical diagnostics, nuclear security, artificial muscles, diver suits, and biofuel cells.

