Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Low Reynolds number, bi-flagellated Quincke swimmers with multiple forms of motion ENDAO HAN, LAILAI ZHU, JOSHUA SHAEVITZ, HOWARD STONE, Princeton University — In the limit of zero Reynolds number (Re), swimmers propel themselves exploiting a series of non-reciprocal body motions. For an artificial swimmer, a proper selection of the power source is required to drive its motion, in cooperation with its geometric and mechanical properties. Although various external fields (magnetic, acoustic, optic, etc.) have been introduced, electric fields were rarely utilized to actuate such swimmers experimentally in unbounded space. Here we demonstrate the viability to generate locomotion of a bi-flagellated sphere at low Re via Quincke rotation using uniform and static electric fields. These Quincke swimmers exhibit three different forms of motion, including a novel self-oscillatory state due to elasto-electro-hydrodynamic interactions [1]. Each form of motion follows a distinct trajectory in space. Our experiments and numerical results demonstrate a new method to generate, and potentially control, the locomotion of artificial flagellated swimmers. [1] L. Zhu and H. A. Stone, Phys. Rev. Fluids, 4, 061701(R), 2019.

Endao Han
Princeton University

Date submitted: 02 Aug 2020 Electronic form version 1.4