Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Simultaneous measurement of flow, rheology and structures of shear resistant biofilms in shear flows JIAN SHENG, MARYAM JALALI, WEI XU, Texas AM UniversityCorpus Christi — Recent studies reveal that flow shear plays significant role in shaping 3D architecture of biofilms formed in flows. They include physiological (phenotype composition), topological and rheological (viscoelasticity) structures enable the biofilm's adaption to high shear environment. To elucidate key mechanisms among cells, films, and flows that allow them to resist flow-induced shear-erosion, we have developed a close-loop *Ecology-on-a-chip* (*eChip*) microfluidic platform including a chemostat, two peristaltic pumps, and a microchannel, which allows in-situ inoculation, growth and maturation of biofilms under realistic flow shear (U_c =0.5 m/s) and long-term (>weeks) observations at film-relevant scales. The platform integrated with an inverted microscope lasers and cameras allows us to perform high-speed microscopy to quantify instantaneous film viscoelasticity, time-lapsed scanning epi-fluorescent microscopy to resolve 3D film topology and composition, and digital holographic microscope to measure near film flow shear and cell motility. Biofilms by GFP-labeled *Pseudomonas aeruginosa* (PAO1) are grown under three different flow shear, while film and flow characteristics are measured at every 20 min. The correlative relations between biofilm structure and shear will be established and presented in the talk. Funded by ONR, ARO

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Date submitted: 14 Aug 2020 Electronic form version 1.4