Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Measurement of biofilm stresses in laminar flows by a digital holography interferometry (DHI) and an embedded wrinkle free thin-film polymer mirror MARYAM JALALI, JIAN SHENG, Texas A&M — Bacteria are unicellular microorganisms that commonly exist in either planktonic and biofilm lifestyles. Biofilms have viscoelastic nature and are subject to deformation under external disturbances (e.g. fluid sheer stress). Here we developed a technique to perform in-situ measurement of viscous stresses exerted biofilm under different flow velocities. The experiments are performed in a uniquely developed microfluidic platform composed of a flexible thin-film mirror embedded in Polydimethylsiloxane (PDMS), that performs as a stress sensitive substrate. This 30nm aluminum thin film is sandwiched between two PDMS layers, and is free of wrinkles and cracks in addition to being specular reflective. The microfluidics is attached to a chemostat and two peristaltic pumps that continuously flow bacterial suspensions in close-loop to facilitate biofilm growth and generate flow shear. DHI measures nano-strain of the thin-film and consequently stresses via finite element modeling of thin film.

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Date submitted: 02 Aug 2019 Electronic form version 1.4