

Abstract Submitted
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Low Reynolds Number Biofilm Streamers Form as Highly Viscous Liquid Jets ALOKE KUMAR, Department of Mechanical Engineering, University of Alberta, Edmonton, Alberta, Canada T6G 2G8, MAHTAB HASSANPOURFARD, Department of Chemical and Materials Engineering, University of Alberta, Edmonton, Alberta, Canada T6G 2G8, SIDDHARTHA DAS, Department of Mechanical Engineering, University of Maryland, College Park, MD-20742, USA — There are recent experimental investigations that suggest that in presence of low Reynolds number ($Re \ll 1$) transport, preformed bacterial biofilms may deform into filamentous structures termed as streamers. Streamer formation time-scales usually far exceed reported rheological relaxation time scales for biofilms. Here we propose a theory that hypothesizes that streamers form due to the viscous response of the viscoelastic biofilms. The theoretical model is based on a stability analysis and can accurately explain hitherto unresolved issues, such as extremely large time needed for appearance of streamers and exponential growth of streamer dimensions after it has formed. We also provide results from our own initial experiments that indicate towards the validity of this “liquid-state” hypothesis.

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