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Failure of bacterial streamers in creeping flows ISHITA BISWAS, Department of Mechanical Engineering, University of Alberta, Edmonton, T6G 2G8, RANAJAY GHOSH, Department of Mechanical and Aerospace Engineering, University of Central Florida, Orlando FL 32816, MOHTADA SADRZADEH, ALOKE KUMAR, Department of Mechanical Engineering, University of Alberta, Edmonton, T6G 2G8 — In the recent years, the dynamical response of filamentous bacterial aggregates called bacterial streamer in creeping flows has attracted attention. We report the observation of 'necking-type' instability leading to failure in bacterial (*Pseudomonas fluorescens*) streamers formed in creeping flows. Quantification of the failure process was made possible through the use of 200 nm red fluorescent polystyrene tracer particles embedded in the bacterial extracellular polymeric substances (EPS). The nonlinear failure behavior shows distinct phases of deformation with mutually different characteristic times, which end with a distinct localized failure of the streamer. We also develop a simplified analytical model to describe the experimental observations of the failure phenomena. The theoretical power law relationship between critical stretch ratio and the fluid velocity scale matches closely experimental observations.

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