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**Morphological Approach toward Elucidating Transport and Shear Behavior of Biofilms** ALOKE KUMAR, Biosciences Division, Oak Ridge National Lab, Oak Ridge, TN 37831, PALLAB BARAI, PARTHA MUKHERJEE, Department of Mechanical Engineering, Texas A&M University, College Station, TX 77843 — Biofilms are complex three-dimensional matrix encapsulated aggregations of microbes that grow on a solid surface. Distribution of microbes inside the matrix or extracellular polymer substances (EPS) affects diffusive transport as well as mechanical response of the biofilm under shear induced deformation. In this work, a morphology-aware computational approach encompassing a digital representation of the biofilm is presented. Confocal microscopy images of biofilms are employed for the digital morphology constructs. For mechanical response under shear, the biofilm can be viewed as rigid bacteria inclusions dispersed inside a cross-linked polymer gel (EPS). The digital biofilm model takes into account the unfolding behavior of proteins to characterize the mechanical response of the EPS. Experimentally observed strain stiffening behavior of biofilms has been captured using the computational approach. Transport simulation reveals the influence of bacterial loading and aggregates in the biofilm on the diffusion behavior.

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