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Polymer confinement and bacterial gliding motility JUNHWAN JEON, ANDREY DOBRYNIN, Polymer Program, Institute of Materials Science, Department of Physics, University of Connecticut — Cyanobacteria and myxobacteria use slime secretion for gliding motility over surfaces. In cyanobacteria the slime is extruded from the nozzle-like pores of 14-16 nm outer diameter and approximately 7nm inner diameter located near the septa that separate the cells of a filament. The pores are inclined at an angle of 30-40 degrees relative to the cell axes, and are oppositely directed on both sides of the septum. Such pore orientation provides directionality for the slime secretion as well as cell motion. To understand the mechanism of gliding motion and its relation to slime polymerization, we have performed molecular dynamics simulations of a molecular nozzle with growing inside polymer chains. These simulations show that the compression of polymer chains inside the nozzle is a driving force for its propulsion. There is a linear relationship between the average nozzle velocity and the chain polymerization rate with a proportionality coefficient dependent on the geometric characteristics of the nozzle such as its length and friction coefficient. This minimal model of the molecular engine was used to explain the gliding motion of cyanobacteria and myxobacteria over surfaces.

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