

The propulsion of bacteria under the action of an actin gel network is examined in terms of gel concentration dynamics. The model includes the elasticity of the network, the gel-bacterium interaction, the bulk and interface polymerization. A formula for the cruise velocity is obtained where the contributions to bacterial motility arising from elasticity and polymerization are made explicit. Higher velocities correspond to lower concentration peaks and longer tails, in agreement with experimental results. The condition for the onset of motion is explicitly given. The behavior of the system is explored by varying the growth rates and the gel elasticity. At steady state two regimes are found, respectively, of constant and pulsating velocity; in the latter case, the velocity undergoes sudden accelerations and subsequent recoveries. The transition to the pulsating regime is obtained by increasing the elastic response of the gel.