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Squeeze film flow analysis of pulsed microjet actuators MAX ROMAN, ARNAUD GOULLET, NADINE AUBRY, New Jersey Institute of Technology — Microfabrication (MEMS) offers a platform to build miniaturized inexpensive, reliable, light-weight, and low power actuators and sensors. Such small actuators can have a very unique function in microfluidics, where they can serve as micromixers, pumps, and non-invasive cell manipulators. In this work, theoretical modeling and computer simulation is used to analyze pulsed microjet actuators. We have derived a low dimensional theoretical model, which takes into account the coupling between the electrostatic actuation, the solid deformation of the membrane, and the squeeze flow in the cavity. The pressure generated in the cavity by the deforming membrane is described in terms of actuation frequency and membrane deflection amplitude. The cavity pressure characterizes the performance of the microjet, which is measured in terms of nozzle exit velocity, and the microjet's operation is optimized for a minimum voltage input. To validate the model, we use computer simulation to evaluate the pressure and the nozzle exit velocity over the range of parameters of the problem.

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