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Electric Field-driven Deformation and Translation of Vesicles in Microchannels ADNAN MORSHED, PRASHANTA DUTTA, Washington State University — Bio-mimetic vesicles like liposomes exhibit complex responses when exposed to electric pulses. Their lipid membranes bear close resemblance to biological cells. Yet the lack of internal cytoskeletons and transmembrane organelles lead to different membrane deformation characteristics. The response of these vesicles is also affected by the electrical properties of the media and vesicle size and shape. We investigated the electrodeformation and transport of bio-mimetic vesicles immersed in a fluid media under a DC electric field. The deformation characteristics of vesicle membrane was represented with a Mooney-Rivlin constitutive law. The electric field, flow field, and vesicle deformation are resolved with a hybrid immersed resolved technique. Additionally, electroosmotic flows are considered for a range of surface charge conditions. Depending on the direction and magnitude of the electroosmotic flow, tumbling, tank treading, and pure translational motions were observed. Furthermore, a logarithmic scaling is realized between translational velocity of the vesicle and shear rate under electroosmotic flows. Conductivity ratio of vesicle and the surrounding media is found as a key parameter in the translational motion as well.

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