Micro energy harvesting based on electrokinetic microfluidic process

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Electrokinetic behavior is present due to the electric double layer, which forms as a result of the distribution of ion charges near a charged surface. The streaming potential is the opposite electrokinetic phenomenon to electro-osmosis in that it uses motion to realize energy harvesting. We investigated electrokinetic viscous flows by analyzing the theoretical model that is formulated with the Poisson-Boltzmann field, the flow field with Cauchy momentum equation, and the Nernst-Planck equation on the basis of net current conservation. Our simulation framework allows one to quantify the flow-induced streaming potential and current with variations of channel geometry, fluid properties, flow conditions, and surface properties. This presentation reports our results regarding the implication of optimum variables toward possible enhancement of power density and energy conversion efficiency. Experimental results obtained by using microfluidic chip are compared with computation results.