Abstract Submitted
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Direct numerical simulations of three-dimensional electrokinetic flows KENG-HWEE CHIAM, Institute of High Performance Computing, Singapore — We discuss direct numerical simulations of three-dimensional electrokinetic flows in microfluidic devices. In particular, we focus on the study of the electrokinetic instability that develops when two solutions with different electrical conductivities are coupled to an external electric field. We characterize this "mixing" instability as a function of the parameters of the model, namely the Reynolds number of the flow, the electric Peclet number of the electrolyte solution, and the ratio of the electroosmotic to the electroviscous time scales. Finally, we describe how this model breaks down when the length scale of the device approaches the nanoscale, where the width of the electric Debye layer is comparable to the width of the channel, and discuss solutions to overcome this.

Keng-Hwee Chiam
Institute of High Performance Computing, Singapore

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