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Geometric effects on electrocapillarity in nanochannels[1] JUNG A. LEE, IN SEOK KANG, Pohang Univ of Sci & Tech — Electrocapillarity phenomenon at the electrified surfaces due to an external voltage or surface charge has been regarded as an efficient tool in micro/nanofluidics. Especially in nanochannels, high surface area with small fluid volume makes the problem more attractable. However, the overlapped electric double layer (EDL) should be carefully considered. In this study, the effects of nanochannel geometry on the electrocapillarity have been studied. Poisson-Boltzmann (PB) equation is solved to get the electric potential distribution of electrolyte solution. Total stress exerted on the gas-liquid interface is expressed by the sum of electric stress from Maxwell stress tensor and the osmotic pressure due to the ionic concentration. The average value of this total stress can be regarded as the measure of electrocapillarity. In the present work, nanochannels with various cross sectional shapes are considered. Using the linearized PB equation, analytic solution for the circular cross-sectional case is obtained and this solution is compared with other cross-sectional cases with the same hydraulic diameter. Several equilateral polygon cases are also analyzed numerically and the results can be unified if they are represented in terms of hydraulic diameter.

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