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Anomalous ion concentration distribution inside ion concentration polarization (ICP) layer by electrodeless measurement INHEE CHO, WONSEOK KIM, Seoul National University, Korea, HYOMIN LEE, Pohang University of Science and Technology, JUNSU KIM, Seoul National University, Korea, GUN YONG SUNG, Hallym University, SUNG JAE KIM, Seoul National University, Korea — An ion concentration profile inside the cathodic side of cation-selective membrane with dc bias has been reported to be a flat with aid of numerical simulation. While rigorous experimental evidences with microelectrode array have supported the flat profile, undesirable effects such as electrode reactions have hindered an accurate measurement. In this work, a microchannel with micro-grooves inside an ion depletion zone (or ICP layer) is employed to capture a vortical electrokinetic flow in the groove. By measuring the speed of the flow, one can convert it into the local ionic concentration, since the local speed of electrokinetic flow is proportional to the local electric field which is inversely proportional to the local ionic concentration. As a result, we can indirectly measure the full ion concentration profile inside ICP layer without any undesirable disturbance and find that the profile is neither flat nor monotonic. Instead, there are peaks and, more importantly, the locations of the peaks strongly depend on the mobility of majority carrier (Li^+ , Na^+ and K^+). The samples inside the ICP layer are analyzed by mass spectrometry to confirm the dependency.

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