

Abstract Submitted
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The Formation of Ion Concentration Polarization Layer Induced by Bifurcated Current Path¹ JUNSU KIM, HYOMIN LEE, INHEE CHO, SNU, ECE, HO-YOUNG KIM, SNU, MAE, SUNG JAE KIM, SNU, ECE, EES TEAM, MFM TEAM — Ion Concentration Polarization (ICP) is a fundamental electrokinetic phenomenon that occurs near a perm-selective membrane and, thus, the characteristics can be significantly altered by the current path through the Nafion nanoporous membrane. In this work, a new ICP device that bifurcated the current path was fabricated using micro/*micro-nano*/nano/micro hybrid channel connection, while a conventional ICP device has employed micro/nano/micro channel connection. The propagation of ICP layer was initiated from the nano-channel at high concentration regime and from *micro-nano* connection at low concentration regime. Interestingly, the reverse propagation was observed at low concentration regime as well. These combined effects conveyed a competition between two distinguishable propagations at intermediate concentration regime, caused by singularity of the bifurcated current path. Experiments and an equivalent circuit analysis were conducted for this bifurcation. As a result, the conductance ratio of electrolyte to Nafion governed the bifurcation. Conclusively, the bifurcation-induced ICP layer formation was able to be characterized by analyzing current-time characteristic which have two distinct RC delay times.

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