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The effect of multiple nanofluidic channels connected in series on the resulting ion concentration-polarization phenomenon BARAK SABBAGH, SINWOOK PARK, Technion - Israel Institute of Technology, ELAD STOLOVICKI, Weizmann Institute of Science, GILAD YOSSIFON, Technion - Israel Institute of Technology — Ion concentration-polarization (ICP) phenomenon results from an electric current passing through an ionic permselective medium (e.g. nanochannel/membrane). This phenomenon has been intensively studied in relation with microfluidic applications, e.g. on-chip desalination and enhanced biosensing sensitivity. Herein, we extend previous studies of ICP by investigating both the transient and steady-state effect of multiple nanofluidic channels connected in series. A simplified analytical one-dimensional modeling of the system along with experiments demonstrated both the electrical response and ICP layers propagation under conditions of net flow. Moreover, the formation of a preconcentrated plug of molecules in between two adjacent nanochannels, exhibiting a third species effect, has been studied. To realize multiple nanofluidic channels connected in series, a soft elastomeric valves were used, where the cross section dimensions of the channel are changeable from micro- to nano- meter scale by deforming the valve.

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