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Measuring Streaming Current/Potential in Microchannel Arrays
ALI MANSOURI, AYDIN JAFARNEJAD, U of Alberta, DANIEL KWOK, U of Calgary, LARRY KOSTIUK, U of Alberta — Streaming current/potential measurements have been commonly used to estimate interfacial properties. This paper explores challenges in conducting these measurements in an array of parallel microchannels, which is akin to flow through porous media. The issue that arise with these arrays is that increasing the number of channels subsequently increases the total conductance across an array. In situations with a large number of channels this array conductance can become comparable to the conductance in the bulk fluid in the reservoirs where electrodes are placed. In these cases, current drawn through an external electrical circuit connecting the two reservoirs (i.e. streaming current) become highly dependent on the location, material and surface area of the electrodes. However, with fewer channels the relative magnitude of conductances can be made such that this externally measured current is independent of these parameters and more representative of the streaming current. Streaming potential measurement, since they do not involve external current flow, also do not show these dependencies. In this study variations in the electrode materials (bright platinum, platinized platinum, silver and stain steel), size of electrodes, placement of the electrodes and electrolyte concentration (10^{-3}M KCL, 10^{-4}M KCL and 0 M KCL) were used to affect the relative conductance in the system and to highlight these characteristics.

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