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Streaming Potential generated by two-phase flow in a capillary ETIENNE LAC, JOHN SHERWOOD, Schlumberger Cambridge Research — Streaming potentials generated by two-phase flow in a porous medium are much less well understood than those generated by single phase flow. We study the Stokes flow of a droplet in a straight capillary as a function of drop size, capillary number and ratio of the viscosity of the drop to that of the surrounding fluid. The electrical double layer on the wall of the capillary is assumed to be thin and the ζ-potential is small; the drop is assumed to be perfectly insulating. Boundary integral methods are used to solve both the Stokes equation and the Laplace equation for the electric field within the capillary. The change in streaming potential due to the presence of the drop is computed, as is the change in pressure drop and in electrical resistivity. The results show that the ratio between the increased pressure drop and increased streaming potential can take either sign, depending upon the drop viscosity and capillary number. The effect of a constriction within the capillary will also be discussed.

Etienne Lac
Schlumberger Cambridge Research

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