

Inertial migration based concentration factors for suspensions of *Chlorella microalgae* in branched tubes

Narendra M. Poffe¹, Allen L. Rakow, David S. Dandy

Chemical and Bioresource Engineering

Colorado State University

Fort Collins, CO 80523

U.S.A.

and

Micheal L. Chappell² and Marie-Noëlle Pons³

Abstract

When a dilute suspension flows in the laminar regime through a tube, under certain conditions the suspended particles migrate radially to an equilibrium radial position. Branched tubes can utilize this radial concentration distribution to concentrate dilute suspensions. Suspensions of microalgae, *Chlorella vulgaris*, were pumped through various diameter tubes for tube Reynolds number ranging from 47 to 1839 and photographed. Upstream particle concentration profiles were obtained by image analysis of the photographs. The dividing stream surfaces in branched tubes were obtained from the three-dimensional numerical solutions of the Navier-Stokes equations for steady, laminar, and homogeneous flow through tubes having one and two orthogonal branches. Concentration factors for *Chlorella* suspensions in branched tubes, predicted by a general method, fall in the range 1.0 to 1.3. Experimental results for a single branch tube fall in this range.

¹The author to whom correspondence should be directed

²Dow Chemical, Freeport, Texas

³ENSIC, Nancy, France