can include use in the development of cosmetics, lubricants, pigments, environmental monitoring for particulates, natural oil extraction, particle synthesis, and polymer bead manufacturing, among many others. In research, the system of the invention can be used in tissue engineering, drug control release mechanism studies, cell signaling studies, protein crystallization, virus/bacteria capture, nucleic acid purification, and chemistry specific extractions among many others. In the field of agriculture, the system of the invention can find application in the development of multi-phase fertilizer emulsions, multi-phase pesticide emulsions, flow cytometry, as well as in hematology analysis. The possible applications for the systems and methods of the invention are varied and broad across all research, industrial, and commercial applications.

[0283] One skilled in the art will appreciate further features and advantages of the invention based on the above-described embodiments. Accordingly, the invention is not to be limited by what has been particularly shown and described, except as indicated by the appended claims. All publications and references cited herein are expressly incorporated herein by reference in their entirety.

What is claimed is:

1.-**196**. (canceled)

197. A method for focusing particles suspended within a moving fluid, the method comprising:

providing a substrate including at least one channel having an inlet, an outlet, a plurality of sides, wherein the relative geometry of the sides defines an aspect ratio, and a channel hydraulic diameter (D_h);

flowing a fluid having a substantially constant kinematic viscosity (v) that includes suspended particles, each having a particle diameter (a), through the at least one channel; and

driving the fluid that includes the suspended particles through the at least one channel at a maximum channel velocity (U_m) resulting in a laminar fluid flow and a particle Reynolds Number (R_p) of greater than or equal to 0.2, wherein the particle Reynolds number is defined as, and resulting in forming one or more localized stream lines in the fluid;

wherein each localized stream line defines a width that is substantially equal to or greater than a size of the focused particles, and the particles suspended in the fluid are focused into the one or more localized stream lines, wherein the number and relative cross-sectional position of the one or more localized stream lines are uniquely defined by the aspect ratio and the particle Reynolds number.

198. The method of claim **197**, wherein the aspect ratio is defined by a width and a height of the at least one channel, and wherein when the aspect ratio is substantially 1 to 1, the particles suspended in the fluid are focused into four localized stream lines.

199. The method of claim **197**, wherein the aspect ratio is defined by a width and a height of the at least one channel, and wherein when the aspect ratio is substantially 2 to 1, the particles suspended in the fluid are focused into two localized stream lines.

200. The method of claim **197**, wherein the at least one channel is a straight channel dimensioned and configured such that the particles suspended in the fluid are focused into each of at least two localized stream lines formed in the straight channel.

201. The method of claim **197**, wherein the at least one channel is a curved channel dimensioned and configured such that the particles suspended in the fluid are focused into a single localized stream line formed in the curved channel.

202. The method of claim **201**, wherein the curved channel is symmetric and sigmoidal.

203. The method of claim **201**, wherein the curved channel is asymmetric and sigmoidal.

204. The method of claim **201**, wherein a radius of curvature of the curved channel varies.

205. The method of claim **197**, wherein a ratio of the particle diameter to the at least one channel hydraulic diameter is greater than or equal to about 0.07 and less than or equal to about 0.5.

206. The method of claim **197**, wherein the width defined by each localized stream line is about five times the particle diameter.

207. The method of claim **197**, further comprising:

flowing the fluid through at least first and second outlet branches at an outlet portion of the at least one channel; wherein at least one of the first and second outlet branches is located to receive the particles that are focused into a localized stream line.

208. The method of claim **197**, wherein the particles have a particle diameter in a range of 0.01 μm to 40 μm.

209. The method of claim **197**, further comprising driving the fluid that includes the suspended particles through the at least one channel such that the focused particles are spaced approximately evenly longitudinally within a localized stream line.

210. The method of claim **197**, wherein the aspect ratio is defined by a width and a height of the at least one channel, and wherein the aspect ratio varies along the at least one channel from about 1 at the inlet to about 2 at the outlet.

211. The method of claim **197**, further comprising detecting particles focused in a localized stream line.

212. The method of claim **197**, further comprising tagging selected particles with one or more tags.

213. The method of claim **212**, wherein the tag comprises a magnetic bead coupled to one or more antibodies that specifically bind to the selected particles.

* * * * *