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devices and methods. The present device and method are simpler to implement as no imbedded electrodes or salt bridges are necessary. In addition, like isoelectric focusing, temperature gradient focusing can be used to both concentrate and separate analytes, but without the disadvantages associated with isoelectric focusing.

A further advantage of the present invention is provided in that only a single, continuous buffer system is required. Solid phase extraction and related preconcentration methods of the prior art require multiple buffers where one buffer is used to carry the analyte to the preconcentrator and a second buffer is used to release the analyte from the preconcentrator. Further examples of multiple buffer systems include sample stacking, field amplified injection, isotachopheresis, and sweeping.

Further, the present temperature gradient focusing provides enhanced concentration when compared with the prior art of other single preconcentration methods.

Although the invention has been described above in relation to preferred embodiments thereof, it will be understood by those skilled in the art that variations and modifications can be effected in these preferred embodiments without departing from the scope and spirit of the invention.

What is claimed is:

1. A method for directing ionic analytes contained in an ionic buffer solution, said ionic buffer solution having a temperature dependent property selected from the group consisting of ionic strength and pH, said method comprising the steps of:

applying an electric field to an ionic buffer solution containing at least one species of ionic analyte to cause the analyte ions to have electrophoretic motion;

establishing, in said buffer solution, a temperature gradient having a significant component substantially aligned with the electrophoretic motion of the analyte ions, which produces a gradient in the ionic strength or pH of said buffer solution, thereby generating a gradient of the electrophoretic velocity of the analytes; and producing a bulk flow of said buffer solution to have a significant component substantially aligned in the direction opposite the direction of the electrophoretic motion of one or more of the analytes so that at least one of said one or more analytes will accumulate or be focused at at least one point along said temperature gradient, the pH at said at least one point being unequal to the isoelectric point of said at least one of said one or more analytes that are focused at said at least one point.

2. The method of claim 1, wherein said temperature dependent property is ionic strength and said temperature gradient establishes a gradient in the ionic strength of said ionic buffer solution.

3. The method of claim 2, wherein said temperature gradient is applied so as to produce an electrophoretic velocity gradient which concentrates analytes present in the ionic buffer solution.

4. The method of claim 2, wherein said temperature gradient is applied so as to produce gradients in the electrophoretic velocities of the analytes present in the ionic buffer solution thereby causing different analytes to focus at different points within the ionic buffer solution so as to separate the different analytes.

5. The method of claim 2, wherein the analyte is selected from the group consisting of small ions, amino acids, DNA, particles, cells and proteins.

6. The method of claim 2, wherein the bulk flow is generated by electroosmosis.

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7. The method of claim 2, wherein the bulk flow is generated by pressure gradients.

8. The method of claim 2, wherein the bulk flow is generated by a combination of electroosmosis and pressure gradients.

9. The method of claim 2, wherein at least one operational parameter selected from the group consisting of temperature, electric field and bulk flow rate is varied over time to affect the position and width of focused sample peaks.

10. The method of claim 2, wherein operational parameters consisting of temperature, electric field, and bulk flow rate are held constant.

11. The method of claim 2, wherein the temperature gradient is one of linear and non-linear.

12. The method of claim 2, wherein the temperature gradient is one of monotonic and non-monotonic.

13. The method of claim 2, wherein the step of establishing a temperature gradient comprises applying an electric current to the ionic buffer solution to produce the temperature gradient by Joule heating.

14. The method of claim 2, wherein the ionic buffer solution is supplied as a continuous single buffer flow.

15. The method of claim 2, wherein the ionic buffer solution and analytes are contained within a microchannel.

16. The method of claim 15, wherein the step of establishing a temperature gradient comprises supplying thermal energy to the microchannel via a heated block.

17. The method of claim 15, wherein the step of applying a temperature gradient comprises cooling a portion of the microchannel using the ambient temperature as a maximum temperature.

18. The method of claim 15, wherein the step of applying a temperature gradient comprises supplying thermal energy to the microchannel via a heated block and removing thermal energy from the microchannel via a cooled block.

19. The method of claim 2, wherein the ionic buffer solution and analytes are contained within a capillary tube.

20. The method of claim 19, wherein the step of establishing a temperature gradient comprises supplying thermal energy to the capillary tube via a heated block.

21. The method of claim 19, wherein establishing a temperature gradient comprises cooling a portion of the capillary tube using ambient temperature as a maximum temperature.

22. The method of claim 19, wherein the step of establishing a temperature gradient comprises supplying thermal energy to the capillary tube via a heated block and removing thermal energy from the capillary tube via a cooled block.

23. The method of claim 1, wherein said temperature dependent property is pH and said temperature gradient establishes a gradient in the pH of said ionic buffer solution, and whereby analytes are focused at a pH other than the isoelectric points of the respective analytes.

24. The method of claim 1, wherein said temperature gradient establishes gradients in both the ionic strength and pH of the ionic buffer solution, and whereby analytes are focused at a pH other than the isoelectric points of the respective analytes.

25. A fluidic device, comprising:

a fluid conduit;

an ionic buffer solution with a temperature dependent property selected from the group consisting of ionic strength and pH disposed in said fluid conduit;

an electric voltage source for providing an electric field within said fluid conduit, thereby causing one or more ionic analytes to have electrophoretic motion;