

an end user does not have to perform a separate manual spectral calibration, making this a calibration-less instrument from an end user's perspective. In other embodiments, the need to perform separate runtime or pre-run calibrations is reduced by the use of in-run calibration or other correction of spectral error.

[0008a] An embodiment provides a method for quality control of a process performed on a sample, the method comprising:

- providing a plurality of capillaries;
 - providing a polymer solution;
 - applying a pressure to the polymer solution and transferring at least a portion of polymer solution into the capillaries;
 - while applying the pressure, measuring at least one parameter indicative of a sensed value of pressure over time to obtain pressure values;
 - performing an analysis on at least a portion of the pressure values; and
- using the analysis to make a determination whether a capillary electrophoresis run for a sample should proceed.

[0008b] Another embodiment provides a method comprising:

- providing a sample containing one or more biological molecules;
 - performing a process or assay on the sample;
 - while performing the process or assay, detecting the one or more biological molecules within a detection zone;
 - before or during detecting, measuring two or more parameters associated with the process or assay; and
 - performing an action based on one or more measured values of the two or more parameters;
- wherein the two or more parameters comprises two or more of: a parameter indicative of a sensed value of a pressure associated the process or assay, a parameter indicative of a sensed value of a spectrum of at least one biological molecule within the detection zone, a parameter indicative of a sensed value of a temperature associated with the process or assay, and a parameter indicative of a current associated with a medium carrying the at least one biological molecule.

[0008c] Another embodiment provides a method for quality control of a process performed on a sample, the method comprising:

- providing a plurality of capillaries comprising a detection zone;
- providing a polymer solution;
- applying a pressure to the polymer solution and transferring at least a portion of polymer solution into the capillaries;
- loading a biological sample into the capillaries;
- beginning a capillary electrophoresis run;
- detecting an optical emission from the detection zone;
- after loading and while applying the pressure, measuring a parameter indicative of a sensed value of pressure;
- determining if the sensed value of pressure is within an acceptable operating range;
- if the pressure is within the acceptable operating range, determining whether the sample run has ended;
- if the pressure is not within the acceptable operating range, ending the run.

[0008d] Another embodiment provides a method comprising:

- providing a sample solution containing one or more biological sample molecules;
- performing a process or assay on the sample solution;
- while performing the process or assay, detecting the one or more biological molecules;
- before or during detecting, measuring a first system parameter;
- before or during detecting, measuring a second system parameter;
- performing an analysis on at least some measurements of at least one of the first system parameter and the second system parameter; and
- before or during detecting, performing an action based on the analysis.

[0008e] Another embodiment provides a method for use with a sample processing instrument for automatic correction of spectral error in dye data for dye-labeled samples, the method comprising:

- generating dye data corresponding to dye-labeled samples run through the sample processing instrument, the dye data comprising at least first dye data corresponding to a first sample labeled with a first dye and second dye data corresponding to a second sample labeled with a second dye, the second dye being different than the first dye;

using non-derivative values of at least the first dye data and the second dye data to obtain correlated data that is correlated with spectral error of the first dye data; and
applying a correction function using the correlated data to generate corrected dye data.

[0008f] Another embodiment provides a method for use in identifying the presence of particular dyes on dye-labeled samples processed by a sample processing instrument, the method comprising, during runtime of the sample processing instrument:

using a photodetector to generate spectral data, the spectral data corresponding to intensity measurements at various spectra, for each of a plurality of photodetector scans executed over time on dye-labeled samples in an optical path from a light source to the photodetector;

receiving the spectral data at a processor configured to determine an optimized dye matrix (ODM);

using the processor to calibrate or recalibrate the sample processing instrument during runtime by at least:

using a candidate optimized dye matrix (CODM) and the spectral data to generate dye data;

using the dye data to determine spectral crosstalk values corresponding to spectral crosstalk between dyes of the dye-labeled samples; and

using the spectral crosstalk values and the CODM to determine an ODM.

[0009] Various other aspects of the inventive subject matter will become more apparent from the following description, along with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 illustrates a sample separation and identification instrument in accordance with an embodiment of the present invention.

[0011] FIG. 2 illustrates an exemplary method in accordance with an embodiment of the invention to carry out runtime correction of spectral error in the instrument of FIG. 1.

[0012] FIG. 3 illustrates an exemplary method in accordance with an embodiment of the invention to carry out runtime correction of spectral error in the instrument of FIG. 1.

[0013] FIG. 4 illustrates data corresponding to an exemplary dye matrix of the instrument of FIG. 1 that can be calibrated or re-calibrated in accordance with embodiments of the present invention.

[0014] FIG. 5 illustrates exemplary spectral bin data generated by the instrument of FIG. 1.

[0015] FIG. 6 illustrates exemplary dye data obtained by applying an existing dye matrix to spectral bin data.

CLAIMS

1. A method for quality control of a process performed on a sample, the method comprising:
 - providing a plurality of capillaries;
 - providing a polymer solution;
 - applying a pressure to the polymer solution and transferring at least a portion of polymer solution into the capillaries;
 - while applying the pressure, measuring at least one parameter indicative of a sensed value of pressure over time to obtain pressure values;
 - performing an analysis on at least a portion of the pressure values; and
 - using the analysis to make a determination whether a capillary electrophoresis run for a sample should proceed.
2. The method of claim 1, wherein the analysis comprises determining a noise level in a trace representing the pressure values.
3. The method of claim 1, wherein the analysis comprises determining whether the pressure values remained above a threshold value during a time period in which the pressure was applied.
4. The method of claim 1, wherein the sample comprises a sample solution comprising one or more biological molecules, the method further comprising:
 - while the sample solution is in the plurality of capillaries, detecting the one or more biological molecules;
 - while detecting, measuring current in one or more capillaries in which the biological samples are being moved by the current over time to determine a current trace;
 - performing an analysis on the current trace; and
 - performing an action based on the analysis.
5. The method of claim 1, wherein measuring the parameter indicative of a sensed value of pressure over time comprises measuring the parameter at a plurality of discrete times.

6. The method of claim 4, wherein measuring current over time comprises measuring current at a plurality of discrete times.
7. The method of claim 4, wherein the analysis comprises determining a noise metric corresponding to signal noise in the current trace and further wherein performing an action based on the analysis comprises performing an action based on a value of the noise metric.
8. The method of claim 1, further comprising:
 - if the determination is yes, then proceeding with the capillary electrophoresis run;
 - if the determination is no, then performing an action and determining whether the action has been effective; and
 - if the action is determined to be effective, either repeating the method from the step of applying a pressure to the polymer solution or proceeding with the capillary electrophoresis run.
9. The method of claim 8, wherein performing the action comprises one or more of:
 - maintaining the applied pressure;
 - setting a flag;
 - sending a warning signal;
 - sending a service call signal;
 - sending a check cartridge signal;
 - reducing the applied pressure;
 - increasing the applied pressure;
 - closing a valve between a reservoir of polymer solution and a pump used to apply the pressure;
 - discontinuing transferring; or
 - changing a run condition.
10. A method comprising:
 - providing a sample containing one or more biological molecules;
 - performing a process or assay on the sample;
 - while performing the process or assay, detecting the one or more biological molecules within a detection zone;

before or during detecting, measuring two or more parameters associated with the process or assay; and

performing an action based on one or more measured values of the two or more parameters;

wherein the two or more parameters comprises two or more of: a parameter indicative of a sensed value of a pressure associated the process or assay, a parameter indicative of a sensed value of a spectrum of at least one biological molecule within the detection zone, a parameter indicative of a sensed value of a temperature associated with the process or assay, and a parameter indicative of a current associated with a medium carrying the at least one biological molecule.

11. The method of claim 10, wherein the two or more parameters comprises one or more of:

a polymer valve position;

a polymer valve pressure;

a buffer valve position;

a buffer valve pressure;

a syringe position; and

a syringe pressure.

12. A method for quality control of a process performed on a sample, the method comprising:

providing a plurality of capillaries comprising a detection zone;

providing a polymer solution;

applying a pressure to the polymer solution and transferring at least a portion of polymer solution into the capillaries;

loading a biological sample into the capillaries;

beginning a capillary electrophoresis run;

detecting an optical emission from the detection zone;

after loading and while applying the pressure, measuring a parameter indicative of a sensed value of pressure;

determining if the sensed value of pressure is within an acceptable operating range;

if the pressure is within the acceptable operating range, determining whether the sample run has ended;

if the pressure is not within the acceptable operating range, ending the run.

13. A method comprising:
 - providing a sample solution containing one or more biological sample molecules;
 - performing a process or assay on the sample solution;
 - while performing the process or assay, detecting the one or more biological molecules;
 - before or during detecting, measuring a first system parameter;
 - before or during detecting, measuring a second system parameter;
 - performing an analysis on at least some measurements of at least one of the first system parameter and the second system parameter; and
 - before or during detecting, performing an action based on the analysis.
14. The method of claim 13, wherein the sample solution comprises one or more biological molecules of different length, the method further comprising:
 - loading the sample solution into at least one capillary, the at least one capillary comprising a detection zone;
 - performing a process comprising separating the biological molecules within the at least one capillary by producing an electric potential between a first electrode and a second electrode;
 - measuring a first optical signal produced by illuminating at least one biological molecule in the detection zone;
 - measuring a second optical signal produced by illuminating the detection zone when the at least one biological molecule is not in the detection zone;
 - using at least the first optical signal and the second optical signal to determine a signal-to-noise ratio corresponding to the first optical signal; and
 - during detecting, changing a value of a process parameter based on the signal-to-noise ratio.
15. The method of claim 13, wherein the sample solution comprises one or more biological molecules of different length, the method further comprising:
 - loading the sample solution into at least one capillary, the at least one capillary comprising a detection zone;

performing a process comprising separating the biological molecules within the at least one capillary by producing an electric potential between a first electrode and a second electrode; and

measuring a current through the at least one capillary.

16. The method of claim 15, further comprising:

determining if the current through the at least one capillary over a plurality of measurements matches a predetermined pattern; and

performing an action based on results of determining.

17. The method of claim 15, further comprising:

while detecting, measuring current in the at least one capillary over time to determine a current trace;

performing an analysis on the current trace; and

performing an action based on the analysis.

18. A method for use with a sample processing instrument for automatic correction of spectral error in dye data for dye-labeled samples, the method comprising:

generating dye data corresponding to dye-labeled samples run through the sample processing instrument, the dye data comprising at least first dye data corresponding to a first sample labeled with a first dye and second dye data corresponding to a second sample labeled with a second dye, the second dye being different than the first dye;

using non-derivative values of at least the first dye data and the second dye data to obtain correlated data that is correlated with spectral error of the first dye data; and

applying a correction function using the correlated data to generate corrected dye data.

19. The method of claim 18, wherein the first dye data is obtained by applying an existing dye matrix to spectral data generated from running the dye-labeled samples through the sample processing instrument.

20. The method of claim 18, wherein the correlated data comprises spectral crosstalk values and the correction function comprises modifying the existing dye matrix based on a function of the spectral crosstalk values.

21. The method of claim 18, wherein using non-derivative values of at least the first dye data and the second dye data comprises using such non-derivative values and also using first and/or higher order derivative values of at least the first dye data and the second dye data.

22. A method for use in identifying the presence of particular dyes on dye-labeled samples processed by a sample processing instrument, the method comprising, during runtime of the sample processing instrument:

- using a photodetector to generate spectral data, the spectral data corresponding to intensity measurements at various spectra, for each of a plurality of photodetector scans executed over time on dye-labeled samples in an optical path from a light source to the photodetector;

- receiving the spectral data at a processor configured to determine an optimized dye matrix (ODM);

- using the processor to calibrate or recalibrate the sample processing instrument during runtime by at least:

- using a candidate optimized dye matrix (CODM) and the spectral data to generate dye data;

- using the dye data to determine spectral crosstalk values corresponding to spectral crosstalk between dyes of the dye-labeled samples; and

- using the spectral crosstalk values and the CODM to determine an ODM.