

WHAT IS CLAIMED IS:

1. A biological analysis device for performing capillary electrophoresis, comprising:
a voltage section configured to generate a voltage differential across a cathode connector and an anode connector;
an optical detector system configured to detect light emission from a sample;
a temperature regulation section;
a cartridge holding portion configured to receive at least a portion of a removable cartridge comprising one or more capillaries and a separation medium container;
and
one or more actuators configured to actuate components of the removable cartridge when the removable cartridge is received in the cartridge holding portion.
2. The biological analysis device of claim 1, wherein the one or more actuators are configured to actuate one or more fluid control devices of the removable cartridge.
3. The biological analysis device of claim 1, further comprising a controller programmed to control actuation of the one or more actuators.
4. The biological analysis device of claim 1, wherein the one or more fluid control devices comprise one or both of a valve and a pump.

5. The biological analysis device of claim 1, wherein the cartridge holding portion comprises a cartridge alignment structure configured to engage with a feature of the cartridge to position the cartridge in a predetermined alignment with components of the biological analysis device.

6. The biological analysis device of claim 5, wherein the cartridge alignment structure is configured to align the cartridge with respect to the optical detector device.

7. The biological analysis device of claim 5, wherein the cartridge alignment structure is configured to move the cartridge from a first position to a second position within the biological analysis device.

8. The biological analysis device of claim 1, wherein the temperature regulation section comprises a heating element and an air movement element.

9. The biological analysis device of claim 8, wherein the temperature regulation section comprises a plurality of ports configured to correspond to a plurality of ports in the replaceable cartridge.

10. The biological analysis device of claim 1, wherein the cartridge holding portion further comprises a refrigeration section configured to refrigerate a separation medium stored in a separation medium container of the replaceable cartridge.

11. A replaceable cartridge for a biological analysis device comprising:

a fluid delivery manifold;
one or more capillaries each having a first end and a second end, the first end being
fluidically coupled with the fluid delivery manifold;
a buffer reservoir fluidically coupled with the fluid delivery manifold;
an electrophoresis separation medium container fluidically coupled with the fluid
delivery manifold;
a fluid transfer device configured to transfer the separation medium from the separation
medium storage container through the fluid delivery manifold into the one or
more capillaries.

12. The cartridge of claim 11, further comprising one or more fluid control devices.

13. The cartridge of claim 12, wherein the one or more fluid control devices are configured to be operably coupled to actuators of the biological analysis device for actuation.

14. The cartridge of claim 12, wherein the one or more fluid control devices comprise one or more valves.

15. The cartridge of claim 12, wherein the one or more fluid control devices comprise a fluid transfer device.

16. The cartridge of claim 15, wherein the one or more fluid transfer devices comprises a syringe pump.

17. The cartridge of claim 12, wherein the one or more fluid control devices are passive devices.

18. The cartridge of claim 11, further comprising one or more ports configured to couple with corresponding ports of a first temperature regulation section of the biological analysis device capable of maintaining the temperature of the capillaries at a temperature setpoint above ambient.

19. The cartridge of claim 18, further comprising a second temperature regulation section of the biological analysis device capable of maintaining the temperature of the electrophoresis separation medium at a temperature setpoint below ambient.

20. The cartridge of claim 19, wherein the below ambient setpoint temperature extends the life of the electrophoresis separation medium.

21. The cartridge of claim 11, further comprising an identification element configured to convey cartridge identification information to the biological analysis device.

22. The cartridge of claim 19, wherein the identification element is further configured to convey cartridge usage information to the biological analysis device.

23. The cartridge of claim 19, wherein the identification element is chosen from a radio-frequency identification (RFID) tag, a bar code, and a serial number.

24. The cartridge of claim 11, further comprising an anode extending into the buffer reservoir.

25. The cartridge of claim 22, wherein the anode comprises an electrically conductive connector portion.

26. The cartridge of claim 11, further comprising a detection section, the one or more capillaries extending through the detection section.

27. The cartridge of claim 24, wherein the detection section comprises a glass block movable with respect to a housing of the cartridge, the one or more capillaries being affixed to the glass block.

28. A method for performing capillary electrophoresis using a biological analysis device, comprising:
inserting a removable cartridge comprising one or more capillaries in the biological analysis device;
actuating a fluid transfer device of the removable cartridge using an actuator of the biological analysis device, the actuating the fluid transfer device causing

separation medium to be transferred from a separation medium storage container into the one or more capillaries; and
actuating a buffer valve of the removable cartridge using an actuator of the biological analysis device, the actuating the buffer valve causing ends of the capillaries to be exposed to an electrically conductive buffer.

29. The method of claim 26, further comprising actuating a separation medium valve actuator to close a separation medium valve between the one or more capillaries and a separation medium storage container before the actuating the fluid transfer device.

30. The method of claim 26, further comprising applying a voltage differential between an anode and a cathode of the biological analysis device, the anode being electrically coupled with a first end of the one or more capillaries and the cathode being electrically coupled with a second end of the one or more capillaries.

31. The method of claim 26, further comprising detecting an analyte within the one or more capillaries with an optical detector of the biological analysis device.