operatively coupled to the fluidic manifold and the cartridge; a plurality of waste valves operatively coupled to the system above the cartridge tray, and an imaging reference surface operatively coupled to the imaging device above the cartridge tray.

[0013a] In one aspect, there is provided a system for imaging a plurality of hybridized complexes comprising;

a cartridge as described herein;

a cartridge tray operatively coupled to the system and configured to hold the cartridge;

a first heater operatively coupled to the cartridge;

a second heater operatively coupled to the cartridge;

a magnet operatively coupled to the imaging device below the cartridge tray;

a fluidic manifold operatively coupled to the system above the cartridge tray and configured to hold and control the flow of a plurality of buffers;

a plurality of off-card buffer input valves operatively coupled to the fluidic manifold and the cartridge;

a plurality of waste valves operatively coupled to the system above the cartridge tray; and

an imaging reference surface operatively coupled to the imaging device above the cartridge tray.

[0014] In embodiments of this aspect, the first heater may be configured to heat the first elution channel. In embodiments, the second heater may be configured to heat the second elution channel. In embodiments, the magnet may be configured to move the first magnetic beads and/or the second magnetic beads within the first and/or second binding chambers and/or the first and/or second elution channels. In embodiments, the magnet may be configured to move parallel to the cartridge tray. In embodiments, the plurality of off-card buffer input valves may be configured to receive the plurality of buffers from the fluidic manifold and/or provide the plurality of buffers to the cartridge. In embodiments, the plurality of waste valves may be configured to collect the plurality of buffers from the cartridge. In embodiments, the system further comprises a cam contact pad operatively coupled to the imaging device and configured to allow preloading against at least one contact pad, at least one adjustable contact between a moving clamp and a base of the imaging device, the at least one adjustable contact configured to allow for datum A adjustment, and a clamp motor operatively coupled to the imaging device and configured to move the moving clamp. In embodiments, at least one of the plurality of off-card buffer input valves and the plurality of waste valves operatively coupled to the system above the cartridge tray may be pneumatically controlled.

[0015] Disclosed is a method for purifying a hybridized target molecule sample and imaging the hybridized target molecule, comprising:

(a) receiving a hybridized sample, the sample comprising a plurality of hybridized, complexes comprising target molecules hybridized with first probes and second probes, a plurality of non-hybridized first probes, and a plurality of non-hybridized second probes,

(b) binding the non-hybridized first probes and hybridized complexes of the sample to a first affinity matrix during a first period of time to produce a first mixture,

(c) flowing a first buffer through the first mixture to remove non-hybridized second probes from the first mixture after the non-hybridized first probes and hybridized complexes of the sample bind with the first affinity matrix,

CLAIMS

What is claimed is:

1. A cartridge configured for purifying a hybridized target molecule sample and imaging a hybridized target molecule, comprising:

a sample input area configured to hold a target molecule sample, the sample comprising:

a plurality of hybridized complexes comprising a plurality of target molecules each hybridized with a first probe and a second probe,

a plurality of non-hybridized first probes, and

a plurality of non-hybridized second probes;

a first binding chamber configured to receive and/or contain a first affinity matrix and to receive the sample, wherein:

the first affinity matrix is functionalized with first molecules configured to bind with the non-hybridized first probes and hybridized complexes of the sample during a first period of time;

the first binding chamber is additionally configured to receive a first buffer to remove non-hybridized second probes from the sample after the non-hybridized first probes and hybridized complexes of the sample bind with the first affinity matrix;

a first elution channel attached to the first binding chamber and a means for heating, and which is configured to receive the first affinity matrix after the first period of time and configured for heating the first affinity matrix to elute a first eluted sample comprising the plurality of hybridized complexes and plurality of non-hybridized first probes;

a second binding chamber configured to receive and/or contain a second affinity matrix and to receive the first eluted sample, wherein:

the second affinity matrix is functionalized with second molecules configured to bind with the hybridized complexes during a second period of time;

the second binding chamber is additionally configured to receive a second buffer to remove at least non-hybridized first probes;

a second elution channel attached to the second binding chamber and a means for heating, and which is configured to receive the second affinity matrix after the second period

of time and configured for heating the second affinity matrix to elute a second eluted sample comprising the plurality of hybridized complexes; and

a binding area having an active binding surface configured to receive the second eluted sample and bind with the hybridized complexes.

2. The cartridge of claim 1, wherein the target molecule is a nucleic acid or a protein.

3. The cartridge of claim 1, wherein the first affinity matrix and the second affinity matrix correspond to a first set of magnetic beads and a second set of magnetic beads, respectively.

4. The cartridge of claim 1, wherein the active binding surface comprises one of streptavidin, an avidin, and oligonucleotides.

5. The cartridge of claim 3, wherein the cartridge further comprises:

a bubble vent;

a plurality of buffer input areas,

a plurality of first binding chambers,

a plurality of waste output areas, and

a plurality of bead pads;

and optionally, wherein the plurality of buffer input areas is a plurality of off-card input valves operatively coupled to a fluidic manifold, the plurality of off-card buffer input valves being configured to receive the first buffer and the second buffer from the fluidic manifold and provide the first and buffer to the cartridge; and the plurality of waste output areas is a plurality of waste valves configured to collect the first and second buffer from the cartridge.

6. The cartridge of claim 1, wherein the first probes include capture probes.

7. The cartridge of claim 1, wherein the second probes include reporter probes.

8. The cartridge of claim 5, wherein the bubble vent is configured to separate the sample input and the first binding chamber and to eliminate air bubbles.

9. The cartridge of claim 3, wherein the first magnetic beads include oligonucleotide-coupled magnetic beads.

10. The cartridge of claim 9, wherein the oligonucleotide-coupled magnetic beads include F magnetic beads.

11. The cartridge of claim 3, wherein the second magnetic beads include oligonucleotide-coupled magnetic beads.

12. The cartridge of claim 11, wherein the oligonucleotide-coupled magnetic beads include G magnetic beads.

13. The cartridge of claim 1, the cartridge being operatively coupled to:

a plurality of off-card buffer input valves operatively coupled to a fluidic manifold; and

a plurality of waste valves.

14. The cartridge of claim 1, the cartridge further comprising:

a plurality of on-card buffer input valves operatively coupled to a fluidic manifold.

15. The cartridge of claim 13, wherein the plurality of off-card buffer input valves are configured to receive the first buffer and the second buffer from the fluidic manifold and provide the buffer to the cartridge.

16. The cartridge of claim 1, wherein the flow of the second eluted sample onto the binding area is done in small steps that are re-ordered based on pressure profiles.

17. The cartridge of claim 1, wherein the binding area is further configured to receive a solution formulated to immobilize the second eluted sample on the active binding surface after stretching with flow.

18. The cartridge of claim 17, wherein the solution includes G-hooks, anti-fade media, and fiducials.

19. A system for imaging a plurality of hybridized complexes comprising;

a cartridge according to any of claims 1-16;

a cartridge tray operatively coupled to the system and configured to hold the cartridge;

a first heater operatively coupled to the cartridge;

a second heater operatively coupled to the cartridge;

a magnet operatively coupled to the imaging device below the cartridge tray;

a fluidic manifold operatively coupled to the system above the cartridge tray and configured to hold and control the flow of a plurality of buffers;

a plurality of off-card buffer input valves operatively coupled to the fluidic manifold and the cartridge;

a plurality of waste valves operatively coupled to the system above the cartridge tray; and

an imaging reference surface operatively coupled to the imaging device above the cartridge tray.

20. The system of claim 19, further comprising:

a cam contact pad operatively coupled to the imaging device and configured to allow preloading against at least one contact pad;

at least one adjustable contact between a moving clamp and a base of the imaging device, the at least one adjustable contact configured to allow for datum A adjustment; and

a clamp motor operatively coupled to the imaging device and configured to move the moving clamp.

21. The system of claim 19, wherein at least one of the plurality of off-card buffer input valves and the plurality of waste valves operatively coupled to the system above the cartridge tray are pneumatically controlled.

22. A method for purifying a hybridized target molecule sample and imaging the hybridized target molecule, comprising:

providing the cartridge of any of claims 1-16;

receiving a hybridized sample, the sample comprising a plurality of hybridized complexes comprising target molecules hybridized with first probes and second probes, a plurality of non-hybridized first probes, and a plurality of non-hybridized second probes;

binding the non-hybridized first probes and hybridized complexes of the sample to a first affinity matrix in a first binding chamber during a first period of time;

flowing a first buffer into the first binding chamber to remove non-hybridized second probes from the sample after the non-hybridized first probes and hybridized complexes of the sample bind with the first affinity matrix;

directing the first affinity matrix into a first elution channel;

heating the first affinity matrix to elute a first eluted sample comprising the plurality of hybridized complexes and plurality of non-hybridized first probes;

binding the hybridized complexes of the first eluted sample to a second affinity matrix in a second binding chamber during a second period of time;

flowing a second buffer into the second binding chamber to remove the non-hybridized first probes from the first eluted sample after the hybridized complexes bind with the second affinity matrix;

heating the second affinity matrix to elute a second eluted sample comprising the plurality of hybridized complexes; and

binding the hybridized complexes to an active binding surface for imaging thereof.

23. The method of claim 22, further comprising:

moving a quantity of the first eluted sample across an affinity matrix pad in a first direction and a second direction.

24. The method of claim 22, wherein the first buffer is pumped to move sample-bead mixture through the first bead pad in a first direction and a second direction.