

What is claimed:

1. A system for identifying a plurality of nucleic acid molecules in a sample, said system comprising:

(i) an inlet port and

(ii) a cartridge defining a space containing: multiple primary reaction chambers fluidically coupled to said inlet port to receive material from said inlet port and produce primary reaction chamber products from the material and

a product capture housing enclosing a solid support with a plurality of separate columns of a plurality of product capture subdivisions configured in separate rows and columns, with each separate product capture subdivision comprising an array of a plurality of individual hydrophilic micro-pores or micro-wells, wherein each of said individual hydrophilic micro-pores or micro-wells is separated by hydrophobic surfaces where primary reaction products are further reacted to create array products which are detected in the micro-pores or micro-wells, wherein one or more of the columns of separate product capture subdivisions receive material which has passed through one of said multiple primary reaction chambers.

2. The system of claim 1 further comprising:

(iii) an outlet port for discharging material from said product capture housing.

3. The system of claim 1, wherein the space defined by said cartridge further comprises:

one or more initial reaction chambers into which said inlet port discharges material and from which material is discharged into said multiple primary reaction chambers.

4. The system of claim 1, wherein the space defined by the cartridge further comprises:

multiple secondary reaction chambers, one or more of which are fluidically coupled to one of said multiple primary reaction chambers to receive material from one of said multiple primary reaction chambers and

multiple mixing chambers each fluidically coupled to one of said multiple secondary reaction chambers to receive material from one of said multiple secondary reaction chambers and to discharge material to said product capture housing so that each column of separate product capture subdivisions is fluidically coupled to one of said multiple mixing chambers to receive material from one of said multiple mixing chambers.

5. The system of claim 4, wherein at least some of said multiple primary and secondary reaction chambers are configured to maintain a trough of liquid in said multiple primary and secondary reaction chambers.

6. The system of claim 4, wherein said multiple primary and secondary reaction chambers each have an internal baffle to maintain a trough of liquid in said multiple primary and secondary reaction chambers.

7. The system of claim 4, wherein said multiple primary and/or secondary reaction chambers each have one or more of internal baffles to maintain a plurality of troughs of liquid in said multiple primary and secondary reaction chambers.

8. The system of claim 4, wherein each of said mixing chambers include a divider extending from a position proximate to where material enters said mixing chamber to a position proximate to where material leaves said mixing chambers.

9. The system of claim 4, wherein each of said mixing chambers include a first surface which is highly hydrophobic and a second surface spaced from, and less hydrophobic than, the first surface, wherein the first and second surfaces extend from a position proximate to where material enters each of said mixing chambers to a position proximate to where material leaves each of said mixing chambers.

10. The system of claim 4, wherein said primary reaction chambers and/or said secondary reaction chambers comprise an internal surface on to which oligonucleotide primers or probes can be spotted.

11. The system of claim 1, wherein the product capture subdivisions comprise the array of the plurality of individual micro-pores each having opposed first and second open ends with the first end having a large diameter and the second end having a diameter which is smaller than that of the first end.

12. The system of claim 1, wherein the product capture subdivisions comprise the array of the plurality of individual micro-wells each having an open end and a closed end.

13. The system of claim 4, wherein said product capture housing comprises:

a plurality of fluid channels to permit material to pass from said multiple mixing chambers, through a column of the product capture subdivisions into contact with the array of micro-pores or micro-wells in those subdivisions.

14. The system of claim 1 further comprising:

one or more valves for selectively introducing or removing reagents or reactants into or out of the cartridge through said inlet.

15. The system of claim 2 further comprising:

one or more valves for selectively introducing or removing reagents or reactants into or out of said product capture housing through said outlet port and/or through a location in said product capture housing distal from said outlet port.

16. The system of claim 1 further comprising:

one or more heating elements in said cartridge in a position proximate to said primary reaction chamber and/or in a position proximate to said product capture housing.

17. The system of claim 3 further comprising:

one or more heating elements in said cartridge in a position proximate to said initial reaction chambers.

18. The system of claim 4 further comprising:

one or more heating elements in said cartridge in a position proximate to one of said secondary reaction chambers and/or in a position proximate to one of said multiple mixing chambers.

19. A method for preparing a system for identifying a plurality of nucleic acid molecules in a sample, said method comprising:

providing the system of claim 1 and applying universal tag or capture oligonucleotide primers or probes to the micro-pores or micro-wells of the product capture subdivisions on the solid support within said product capture housing, whereby the universal tag or capture oligonucleotide primers or probes are retained within the micro-pores or micro-wells.

20. The method of claim 19, further comprising:

filling the one or more primary reaction chambers with primary reaction oligonucleotide probes or primers each having a first portion comprising a nucleotide sequence complementary to a portion of target nucleic acids in the sample.

21. A process of identifying a plurality of nucleic acid molecules in a sample using the system prepared by the method of claim 20, wherein the primary reaction oligonucleotide probes or primers further comprise a second portion comprising a nucleotide sequence the same or complementary to a portion of the universal tag or capture oligonucleotide primers, retained within the micro-pores or micro-wells and wherein, following said filling the one or more primary reaction chambers and optionally said filling the one or more secondary reaction chambers, if present, said process further comprising:

conducting the primary and/or secondary reactions in said system and

detecting the presence of target nucleic acid molecules in the sample in the micro-wells or micro-pores after said conducting the primary and/or secondary reactions in said system.

22. The system of claim 11 further comprising: a mesh screen covering the second ends of the micro-pores in said product capture housing.

23. The system of claim 11 further comprising: a bead placed in the individual micro-pores.

24. The system of claim 13, wherein said plurality of fluid channels are located above and below the solid support.

25. The system of claim 13, wherein said plurality of fluid channels are located above the solid support.