

neously screen many patients against all known mutations in a disease gene. This invention could be used in the form of, for example, 96 identical probe carrier pins in a matrix where each probe carrier pin could contain, for example, 1500 DNA fragments representing all known mutations of a given gene. The region of interest from each of the DNA samples from 96 patients could be amplified, labeled, and hybridized to the 96 individual arrays with each assay performed in 10 microliters of hybridization solution. The adapter matrix containing all 96 identical probe carrier pins assayed with the 96 patient samples is incubated, rinsed, detected and analyzed as a single sheet of material using standard radioactive, fluorescent, or colorimetric detection means (Maniatis, et al., 1989). Previously, such a procedure would involve the handling, processing and tracking of 96 separate membranes in 96 separate sealed chambers. By processing all 96 patient samples in a single step with minimal hybridization liquid, significant time and cost savings are possible.

[0189] The assay format can be reversed where the patient or organism's DNA is immobilized as the probe elements and each probe carrier is hybridized with a different mutated allele or genetic marker. A probe carrier matrix can also be used for parallel non-DNA ELISA assays. Furthermore, the invention allows for the use of all standard detection methods.

[0190] One aspect of this invention involves the detection of nucleic acid sequence differences using coupled ligase detection reaction (LDR) and polymerase chain reaction (PCR) as disclosed in U.S. Pat. No. **6,027,889** entitled "Detection of nucleic acid sequence differences using coupled ligase detection and polymerase chain reactions" to Baranyi, et al. which is incorporated herein by reference in its entirety.

[0191] In addition to the genetic applications listed above, arrays of whole cells, peptides, enzymes, antibodies, antigens, receptors, ligands, phospholipids, polymers, drug cogener preparations or chemical substances can be fabricated by the means described in this invention for large scale screening assays in medical diagnostics, drug discovery, molecular biology, immunology and toxicology.

[0192] All publications and patent applications mentioned in this specification are incorporated herein by reference to the same extent as if each individual publication or patent application were specifically and individually indicated to be incorporated by reference.

[0193] The foregoing description of preferred embodiments of the invention has been presented by way of illustration and example for purposes of clarity and understanding. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. It will be readily apparent to those of ordinary skill in the art in light of the teachings of this invention that many changes and modifications may be made thereto without departing from the spirit of the invention. It is intended that the scope of the invention be defined by the appended claims and their equivalents.

What is claimed is:

1. An apparatus for allowing specific identification of samples with probes, comprising

a flexible elongated substrate having a first substrate surface, a length, and a width; and

a plurality of non-identical probes immobilized on discrete areas of a probe-containing portion of the substrate surface, each of said discrete areas containing one probe.

2. The apparatus of claim 1 wherein each discrete area containing one probe has a length not exceeding 500 micrometers.

3. The apparatus of claim 1 wherein each discrete area containing one probe has a length not exceeding 100 micrometers.

4. The apparatus of claim 1 wherein each discrete area containing one probe has a length not exceeding 50 micrometers.

5. The apparatus of claim 1 wherein each discrete area containing one probe has a length not exceeding 20 micrometers.

6. The apparatus of claim 1 wherein the probes are selected from the group consisting of polynucleotides, polypeptides, polysaccharides, and lipids.

7. The apparatus of claim 1 wherein the substrate is made of materials selected from the group consisting of silica, glass optical fibers, metals, magnetizable materials, plastics, polymers, polyimide, and polytetrafluoroethylene.

8. The apparatus of claim 1 further comprising a first marker which conveys information about a first set of said probes and a second marker which conveys information about a second set of said probes.

9. The apparatus of claim 1 wherein the ratio of the length to the width of the substrate exceeds 5:1.

10. The apparatus of claim 1 wherein the ratio of the length to the width of the substrate exceeds 100:1.

11. The apparatus of claim 1 wherein the ratio of the length to the width of the substrate exceeds 10,000:1.

12. The apparatus of claim 1 wherein the ratio of the length to the width of the substrate exceeds 100,000:1.

13. An apparatus for allowing specific identification of samples with probes, comprising

a flexible elongated substrate having a substrate surface, a length, and a width;

a first layer on the surface of the substrate; and

a plurality of non-identical probes immobilized on a probe-containing portion of the surface of said layer, said probe-containing portion having a length and a width such that the ratio of the length of the probe-containing portion to the width of the probe-containing portion exceeds 5:1.

14. The apparatus of claim 13 further comprising a second layer between said first layer and said substrate.

15. The apparatus of claim 14 wherein said first layer comprises silica and said second layer comprises a metallic material.

16. A linear one-dimensional arrangement of probes, comprising

a flexible substrate having at least a first surface; and

a plurality of probes immobilized on the first surface of the substrate and arranged in a single-file row at a linear density exceeding 50 probes/linear cm.

17. The arrangement of claim 16, wherein the linear density of probes arranged in a single-file row on the substrate exceeds 100 probes/linear cm.