CLAIMS

1. A method of detecting the presence of different target analytes in a sample, the method comprising:

providing the sample and a plurality of reporter particles having ω different colours to a substrate, the substrate having α assigned spatial regions; and

determining, on the substrate, the presence of a colour arising from the reporter particles in each of α assigned spatial regions on the substrate,

wherein each of the assigned spatial regions on the substrate is configured to immobilize a target analyte that is different from the other assigned spatial regions,

wherein reporter particles of each different colour are configured to couple to a target analyte that is different from the reporter particles of the other different colours, and

wherein α is an integer that is at least two and ω is an integer that is at least two,

wherein the reporter particles are configured to give rise to a secondary colour when reporter particles of two or more different colours are colocalized in the same spatial region, wherein the secondary colour resulting from the colocalization of the reporter particles of two or more different colours from the ω different colours is distinct from another secondary colour resulting from the colocalization of reporter particles of other combinations of colours from the ω different colours.

2. The method of claim 1, wherein the presence of a secondary colour arising from the colocalization of reporter particles in an assigned spatial region is indicative of the presence of at least two different target analytes in the sample.

3. The method of claim 1 or claim 2, wherein ω is three.

4. The method of any one of the preceding claims, wherein each of ω different colours is a colour selected from the group consisting of: a colour with absorbance wavelength of from 550 nm to 570 nm, a colour with absorbance wavelength of from 400 nm to 420 nm and a colour with absorbance wavelength of from 610 nm to 630 nm.

5. The method of any one of the preceding claims, wherein each of ω different colours is a colour selected from the group consisting of: yellow, magenta and cyan, and when combined with one of more of the other ω different colours, is configured to give rise to a secondary colour selected from: blue, green, red and black.

6. The method of any one of the preceding claims, wherein the analyte comprises a polynucleotide and the method further comprises subjecting the sample to an amplification reaction configured to amplify the polynucleotide prior to the providing step.

7. The method of any one of the preceding claims, wherein the analyte comprises a polynucleotide and the method further comprises contacting the sample with a labelled oligonucleotide for hybridizing to at least a portion of the polynucleotide or its amplicons thereof, the labelled oligonucleotide being configured to couple to the reporter particles of at least one of ω different colours.

8. The method of claim 7, wherein the oligonucleotide comprises a primer.

9. The method of any one of the preceding claims, wherein the step of providing the sample and the plurality of reporter particles having ω

different colours to a substrate comprises first providing the sample to the substrate and subsequently providing the plurality of reporter particles having ω different colours to the substrate.

10. The method of any one of the preceding claims, wherein the reporter particles of each of ω different colours have a single localized surface plasmon resonance (LSPR) absorption peak.

11. The method of any one of the preceding claims, wherein the reporter particles comprise one or more of the following selected from the group consisting of: solid gold nanoparticles, solid silver nanoparticles with gold core and hollow gold nanoshells.

12. The method of any one of the preceding claims, the method further comprising:

assigning a code to each spatial region based on the colour at the spatial region;

combining the code assigned to each spatial region to obtain a combined code, wherein the combined code is used to determine the presence of different target analytes in the sample; and optionally

comparing the combined code with a list of predetermined codes to determine the presence of different target analytes in the sample.

13. A kit for detecting different target analytes in a sample, the kit comprising:

a substrate that comprises α assigned spatial regions, each spatial region being configured to immobilize a target analyte that is different from the other assigned spatial regions; and

a plurality of reporter particles having ω different colours or precursors thereof, wherein the reporter particles of each different colour are configured to couple to a target analyte that is different from the reporter particles of the other different colours,

wherein α is an integer that is at least two and ω is an integer that is at least two,

wherein the reporter particles are configured to give rise to a secondary colour when reporter particles of two or more different colours are colocalized in the same spatial region, wherein the secondary colour resulting from the colocalization of the reporter particles of two or more different colours from the ω different colours is distinct from another secondary colour resulting from the colocalization of reporter particles of other combinations of colours from the ω different colours.

14. The kit of claim 13, wherein ω is three.

15. The kit of claim 13 or claim 14, wherein each of ω different colours is a colour selected from the group consisting of: a colour with absorbance wavelength of from 550 nm to 570 nm, a colour with absorbance wavelength of from 400 nm to 420 nm and a colour with absorbance wavelength of from 610 nm to 630 nm.

16. The kit of any one of claims 13-15, wherein each of ω different colours is a colour selected from the group consisting of: yellow, magenta and cyan, and when combined with one of more of the other ω different colours, is configured to give rise to a secondary colour selected from: blue, green, red and black.

17. The kit of any one of claims 13-16, further comprising an oligonucleotide for hybridizing to at least a portion of a polynucleotide of the target analyte.

18. The kit of claim 17, wherein the oligonucleotide comprises a labelled oligonucleotide that is configured to couple to the reporter particles of at least one of ω different colours.

19. The kit of any one of claims 13-18, wherein the reporter particles of each of ω different colours have a single localized surface plasmon resonance (LSPR) absorption peak.

20. The kit of any one of claims 13-19, wherein the reporter particles comprise one or more of the following selected from the group consisting of: solid gold nanoparticles, solid silver nanoparticles with gold core, hollow gold nanoshells and any combinations thereof.

21. The kit of any one of claims 13-20, further comprising:

instructions on assigning a code to each spatial region selected from the α spatial regions based on the colour at the spatial region and combining the code assigned to each spatial region to obtain a combined code for determining the presence of different target analytes in the sample; and optionally

a list of predetermined codes for comparison with the combined code to determine the presence of different target analytes in the sample.