CLAIMS

What is claimed is:

1. An array comprising a plurality of three-dimensional hydrogel networks immobilized on a substrate, wherein the three-dimensional hydrogel networks:

(a) comprise crosslinked water-soluble polymer chains and one or more probe molecules; and

(b) have one or more long transport channels and one or more short transport channels.

2. The array of claim 1, wherein the water-soluble polymer chains comprise polymer chains polymerized from dimethylacrylamide (DMAA), methacryloyloxybenzophenone (MABP), and sodium 4-vinylbenzenesulfonate (SSNa).

3. The array of claim 1, wherein the probe molecules are nucleic acid molecules.

4. The array of claim 2, wherein the probe molecules are nucleic acid molecules.

5. The array of claim 1, wherein the probe molecules are crosslinked to the crosslinked water-soluble polymer chains.

6. The array of claim 2, wherein the probe molecules are crosslinked to the crosslinked water-soluble polymer chains.

7. The array of claim 3, wherein the probe molecules are crosslinked to the crosslinked water-soluble polymer chains.

8. The array of claim 4, wherein the probe molecules are crosslinked to the crosslinked water-soluble polymer chains.

9. The array of claim 1, wherein the plurality of three-dimensional hydrogel networks comprises one or more three-dimensional hydrogel networks comprising labeled control probe molecules.

10. The array of claim 9, wherein the labeled control probe molecules are fluorescently labeled.

11. The array of claim 1, wherein the three-dimensional hydrogel networks are crosslinked to the substrate.

12. The array of claim 1, wherein the three-dimensional hydrogel networks are positioned at discrete spots on the substrate.

13. The array of claim 1, wherein the one or more short transport channels are formed from cubic or rod-shaped salt crystals.

14. The array of claim 1, wherein at least one of the three-dimensional networks comprises one or more short transport channels penetrated by one or more long transport channels.

15. The array of claim 1, wherein the one or more long transport channels are formed from needle-shaped salt crystals.

16. The array of claim 13, wherein the one or more long transport channels are formed from needle-shaped salt crystals.

17. A method for determining whether an analyte is present in a sample, comprising:

(a) contacting the array of claim 1 with the sample, wherein the array comprises one or more three-dimensional hydrogel networks comprising probe molecules that are capable of binding to the analyte; and
(b) detecting binding of the analyte to the probe molecules.

18. The method of claim 17, wherein the network has been used and washed at least 10 times prior to step (a).

19. The method of claim 17, which further comprises reusing the network at least 10 times following step (b).

20. The method of claim 17, which further comprises quantifying binding of the analyte to the probe molecules.

21. The method of claim 17, wherein the array comprises at least one three-dimensional hydrogel network comprising a fluorescently labelled oligonucleotide as a reusability control.

22. The method of claim 21, which comprises testing the fluorescent signal strength.

23. The method of claim 22, wherein the reusability control retains at least 70% of its initial fluorescence signal strength after 10 uses.