

**CLAIMS**

1. A three-dimensional network which:
  - (a) is composed of a water-swellaible polymer formed by cross-linking water-soluble polymer chains;
  - (b) is cross-linked to the surface of a rigid substrate;
  - (c) comprises at least 5 channels that: (i) are bounded by the water-soluble polymer chains; and (ii) converge at a point in the interior of the network such that the lateral distance between the channels decreases from the surface of the water-swellaible polymer toward the surface of the rigid substrate; and
  - (d) comprises probe molecules covalently attached to the water-soluble polymer chains.
2. The three-dimensional network of claim 1, which comprises at least 10 channels that converge at a point in the interior of the network such that the lateral distance between the channels decreases from the surface of the water-swellaible polymer toward the surface of the rigid substrate.
3. The three-dimensional network of claim 1, wherein at least a majority of channels in the network extends into the interior of the water-swellaible polymer from a point that is less than 10 microns from the surface of the water-swellaible polymer or extends into the interior of the water-swellaible polymer from a point on the surface of the water-swellaible polymer.
4. The three-dimensional network of claim 3, wherein at least a majority of channels in the network extends into the interior of the water-swellaible polymer from a point that is less than 5 microns from the surface of the water-swellaible polymer or extends into the interior of the water-swellaible polymer from a point on the surface of the water-swellaible polymer.
5. The three-dimensional network of claim 1, wherein at least a majority of channels in the network has a length that is at least 10% of the largest dimension of the network.
6. The three-dimensional network of claim 5, wherein at least a majority of channels in the network has a length that is at least 20% of the largest dimension of the network.
7. The three-dimensional network of claim 1, wherein at least a majority of channels in the network have a minimum cross-section of at least 5 times the network's mesh size.
8. The three-dimensional network of claim 7, wherein at least a majority of the channels have a minimum cross-section of 5 to 25 times the network's mesh size.
9. The three-dimensional network of claim 7, wherein at least a majority of channels in the

network have a minimum cross-section of at least 15 times the network's mesh size.

10. The three-dimensional network of claim 1, wherein at least a majority of the channels have a length that is 15% to 25% of the largest dimension of the network.
11. The three-dimensional network of claim 1, wherein the network has in its hydrated state a mesh size of 5 to 75 nm.
12. The three-dimensional network of claim 7, wherein the network has in its hydrated state a mesh size of 5 to 75 nm.
13. The three-dimensional network of claim 8, wherein the network has in its hydrated state a mesh size of 5 to 75 nm.
14. The three-dimensional network of claim 9, wherein the network has in its hydrated state a mesh size of 5 to 75 nm.
15. The three-dimensional network of claim 1, wherein at least a majority of probe molecules are in the interior of the water-swellaable polymer.
16. The three-dimensional array of claim 1, wherein at least a majority of probe molecules adjoin a channel.
17. An array comprising a plurality of three-dimensional networks according to claim 1, each cross-linked to a separate location on the surface of the rigid substrate.
18. The array of claim 17, comprising at least 8 three-dimensional networks.
19. The array of claim 17, wherein the plurality of three-dimensional networks comprises one or more three-dimensional networks comprising labeled control probe molecules covalently attached to the polymer chains.
20. The array of claim 19, wherein the labeled control probe molecules are fluorescently labeled.
21. The array of claim 17 which can be reused at least 10 times.
22. A process for making a three-dimensional network according to claim 1, comprising the steps of:
  - (a) exposing a mixture positioned on the surface of a rigid substrate to needle-shaped crystal forming conditions, said mixture comprising (i) an aqueous salt solution which

- is optionally a monovalent cation salt solution, (ii) a water-soluble polymer, (iii) a cross-linker, and (iv) probe molecules, thereby forming a mixture containing one or more needle-shaped salt crystals;
- (b) exposing the mixture containing one or more salt crystals to cross-linking conditions, thereby forming a cross-linked polymer network containing one or more needle-shaped salt crystals; and
  - (c) contacting the cross-linked polymer network containing one or more salt crystals with a solvent in which the one or more salt crystals are soluble, thereby dissolving the needle-shaped salt crystals and forming one or more channels in place of the salt crystals.
23. The process of claim 22, wherein: (a) the needle-shaped crystal salt forming conditions comprise: (i) dehydrating the mixture; or (ii) cooling the mixture; and/or (b) wherein the solvent is a water-based buffer.
24. The process of claim 22, further comprising, prior to step (a), a step of applying the mixture to a surface of a rigid substrate.
25. The process of claim 23, wherein the needle-shaped crystal salt forming conditions comprise heating the mixture by contacting the mixture with a gas that has a temperature which is higher than the temperature of the mixture, exposing the mixture to a vacuum, and/or reducing the humidity of the atmosphere surrounding the mixture.
26. The process of claim 25, wherein the needle-shaped crystal salt forming conditions comprise heating the mixture by contacting the mixture with a gas that has a temperature which is higher than the temperature of the mixture.
27. The process of claim 23, wherein the needle-shaped crystal salt forming conditions comprise cooling the mixture by contacting the mixture with a gas that has a temperature which is lower than the temperature of the mixture.
28. The process of claim 24, wherein the mixture is applied to the surface of a rigid substrate in a volume of 100  $\mu$ l to 5  $\mu$ l.
29. A process for making an array, comprising (a) creating a plurality of three-dimensional networks by the process of claim 22 at discrete spots on the surface of the same substrate, and (b) cross-linking the plurality of three-dimensional networks to the surface.