

What is claimed is:

1. A method, comprising:
applying a hydrogel to a surface of a substrate;
grafting primers to the applied hydrogel; and
5 before or after grafting the primers, introducing plasmonic nanostructures to the applied hydrogel.
2. The method as defined in claim 1, wherein the plasmonic nanostructures are functionalized with an alkyne, which covalently attaches to a free azide group of
10 the hydrogel.
3. The method as defined in claim 1, wherein the plasmonic nanostructures are functionalized with an azide, which covalently attaches to an alkyne of the hydrogel.
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4. The method as defined in claim 1, wherein the plasmonic nanostructures are functionalized with a first member of a binding pair, which interacts with a second member of the binding pair that is attached to the hydrogel.
- 20 5. The method as defined in claim 4, wherein the first member and the second member include a NiNTA ligand and a histidine tag, or streptavidin and biotin, or a spytag and a spycatcher, or maleimide and cysteine, or N-hydroxysuccinimide ester and an amine, or an aldehyde and a hydrazine, or an amine and an activated carboxylate, or an amine and N-hydroxysuccinimide ester,
25 or a thiol and an alkylating reagent, or a phosphoramidite and a thioether.
6. The method as defined in claim 1, wherein the surface of the substrate includes depressions separated by interstitial regions, and wherein the method further comprises removing the hydrogel from the interstitial regions prior to grafting
30 the primers and prior to introducing the plasmonic nanostructures.
7. The method as defined in claim 1, wherein the surface of the substrate includes a lane surrounded by interstitial regions, and wherein the method further

comprises removing the hydrogel from the interstitial regions prior to grafting the primers and prior to introducing the plasmonic nanostructures.

8. The method as defined in claim 1, wherein the plasmonic nanostructures
5 are selected from the group consisting of gold nanostructures, silver nanostructures, tin nanostructures, rhodium nanostructures, ruthenium nanostructures, palladium nanostructures, osmium nanostructures, iridium nanostructures, platinum nanostructures, chromium nanostructures, copper nanostructures, gallium arsenide nanostructures, doped silicon nanostructures,
10 aluminum nanostructures, magnesium nanostructures, silver and gold composite nanostructures, and combinations thereof.

9. The method as defined in claim 1, wherein the plasmonic nanostructures each have a solid structure, a hollow structure, or a core-shell structure.

15 10. A flow cell, comprising:
a base support;
a patterned material over the base support, the patterned material including:
a resin matrix material; and
20 a quenching nanostructure dispersed throughout or positioned across a surface of the resin matrix material,
the patterned material defining a region for an active area, the region being surrounded by interstitial regions;
a hydrogel in the region; and
25 a primer attached to the hydrogel.

11. The flow cell as defined in claim 10, wherein the quenching nanostructure is selected from the group consisting of a gold nanostructure, a silver nanostructure, a tin nanostructure, a rhodium nanostructure, a ruthenium nanostructure, a palladium nanostructure, an osmium nanostructure, an iridium nanostructure, a platinum nanostructure, a chromium nanostructure, a copper nanostructure, a gallium arsenide nanostructure, a doped silicon nanostructure, an

aluminum nanostructure, a magnesium nanostructure, a silver and gold composite nanostructure, and combinations thereof.

12. The flow cell as defined in claim 10, wherein the quenching
5 nanostructure has a solid structure, a hollow structure, or a core-shell structure.

13. The flow cell as defined in claim 10, wherein the region includes a lane and the interstitial regions surround the lane.

10 14. The flow cell as defined in claim 10, wherein:
the region is a depression;
the patterned material defines a plurality of the depressions; and
each of the plurality of the depressions is separated by the interstitial
regions.

15 15. A method for increasing a signal to noise ratio during sequencing in a
flow cell, comprising:
nanoimprinting a resin matrix material to form a patterned material including
depressions separated by interstitial regions;
20 depositing a film of quenching nanostructures onto a surface of the
patterned material, the film having a thickness ranging from about 1 nm to about 20
nm;
introducing a hydrogel into the depressions; and
grafting primers to the hydrogel.

25 16. The method as defined in claim 15, wherein the quenching
nanostructures are selected from the group consisting of gold nanostructures, silver
nanostructures, tin nanostructures, rhodium nanostructures, ruthenium
nanostructures, palladium nanostructures, osmium nanostructures, iridium
30 nanostructures, platinum nanostructures, chromium nanostructures, copper
nanostructures, gallium arsenide nanostructures, doped silicon nanostructures,
aluminum nanostructures, magnesium nanostructures, silver and gold composite
nanostructures, and combinations thereof.

17. A method for increasing a signal to noise ratio during sequencing in a flow cell, comprising:

- incorporating quenching nanostructures into a resin matrix material;
- 5 patterning the resin matrix material to define a region for an active area surrounded by interstitial regions;
- introducing a hydrogel into the region; and
- grafting primers to the hydrogel.

10 18. The method as defined in claim 17, wherein the quenching nanostructures are incorporated into the resin matrix material in an amount ranging from about 0.1 wt% to about 10 wt% of a total weight of a mixture of the quenching nanostructures and the resin matrix material.

15 19. The method as defined in claim 17, wherein the quenching nanostructures are selected from the group consisting of gold nanostructures, silver nanostructures, tin nanostructures, rhodium nanostructures, ruthenium nanostructures, palladium nanostructures, osmium nanostructures, iridium nanostructures, platinum nanostructures, chromium nanostructures, copper
20 nanostructures, gallium arsenide nanostructures, doped silicon nanostructures, aluminum nanostructures, magnesium nanostructures, silver and gold composite nanostructures, and combinations thereof.

25 20. The method as defined in claim 17, wherein the region includes a lane and the interstitial regions surround the lane.

21. The method as defined in claim 17, wherein:
the region is a depression;
the patterned material defines a plurality of the depressions; and
30 each of the plurality of the depressions is separated by the interstitial regions.