CLAIMS

1. A surface for target-specific analyte capture, the surface comprising:

a plurality of microposts extending from the surface, the each of the plurality of microposts comprising,

a silicone-based material functionalized with a binding system for capture of a target specific analyte,

the binding system comprising a blocking agent and a binding agent, wherein the binding agent comprises a linker and a capture agent terminally attached to the linker, wherein the length of the linker is configured to allow movement of the capture agent terminally attached, and wherein the size of the blocking agent is smaller than the size of the linker.

2. The surface of claim 1, wherein the linker is configured to act as a "bottlebrush" polymer restricting access to the surface of each of the plurality of microposts thereby reducing non-specific binding.
3. The surface of claim 1 or 2, wherein the linker is a polyethylene glycol (PEG) linker.
4. The surface of claim 3, wherein the PEG linker has a molecular weight from about 500 to about 5000.
5. The surface of claim 1 or 2, wherein the capture agent is biotin or a biotin-conjugate.
6. The surface of claim 1 or 2, wherein the linker is avidin or an avidin-conjugate.
7. The surface of claim 1 or 2, wherein the blocking agent is a polyethylene glycol (PEG) blocking agent.
8. The surface of claim 7, wherein the PEG blocking agent has a molecular weight from about 100 to about 1000.
9. The surface of claim 1 or 2, wherein the silicone-based material comprises a polymer matrix.
10. A microfluidic device comprising,

a reaction chamber comprising the surface of claim 1 or 2, wherein the plurality of microposts extending from the surface are magnetically responsive; and

and at least one magnetic-based actuation mechanism in close proximity to the magnetically responsive plurality of microposts, wherein the magnetic-based actuation mechanism is configured to generate an actuation force sufficient to compel at least some of the magnetically responsive plurality of microposts to exhibit motion.

11. The microfluidic device of claim 10, further comprising at least one channel, configured to allow a fluid to flow into and out of the reaction chamber.
12. A method for functionalizing a surface for target-specific analyte capture, the method comprising:

providing a surface comprising a plurality of microposts extending from the surface, wherein the plurality of microposts comprise a silicone-based material;

functionalizing the plurality of microposts by incorporating a binding system for capture of a target specific analyte, wherein incorporating a binding system comprises anchoring to the plurality of microposts a blocking agent and a binding agent, wherein the binding agent comprises a linker and a capture agent terminally attached to the linker, wherein the length of the linker is configured to allow movement of the capture agent terminally attached, and wherein the size of the blocking agent is smaller than the size of the linker.
13. The method of claim 12, wherein anchoring comprises grafting, bonding, and/or physio-absorption.
14. The method of claim 12 or 13, wherein the linker is configured to act as a “bottlebrush” polymer restricting access to the surface of each of the plurality of microposts thereby reducing non-specific binding.
15. The method of claim 12 or 13, wherein the linker is a polyethylene glycol (PEG) linker.
16. The method of claim 15, wherein the PEG linker has a molecular weight from about 500 to about 5000.
17. The method of claim 12 or 13, wherein the capture agent is biotin or a biotin-conjugate.
18. The method of claim 12 or 13, wherein the linker is avidin or an avidin-conjugate.
19. The method of claim 12 or 13, wherein the blocking agent is a polyethylene glycol (PEG) blocking agent.
20. The method of claim 19, wherein the PEG blocking agent has a molecular weight from about 100 to about 1000.
21. The method of claim 12 or 13, wherein the silicone-based material comprises a polymer matrix.
22. The method of claim 12 further comprising reacting a functional group on the plurality of microposts with a silanizing reagent to produce a plurality of amine modified microposts.
23. The method of claim 22, further comprising adding the one or more functionalizing agents to the amine modified microposts.