

What is claimed is:

1. A microfluidic cartridge comprising:
 - a. a housing forming a reaction chamber;
 - b. a field of surface-attached microposts provided on an interior surface of the housing and extending into the reaction chamber; and
 - c. beads attached to the microposts.
2. The microfluidic cartridge of claim 1, wherein the reaction chamber further comprises openings arranged for flowing fluid into and out of the chamber.
3. The microfluidic cartridge of any of the foregoing claims, wherein the housing comprises two substrates separated to form the reaction chamber as a gap between the substrates.
4. The microfluidic cartridge of any of the foregoing claims, wherein the beads are functionalized.
5. The microfluidic cartridge of any of the foregoing claims, wherein the surface-attached microposts comprise magnetically-responsive microposts that can be actuated using a magnetic actuation mechanism.
6. The microfluidic cartridge of any of the foregoing claims 4 and following, wherein the beads comprise target-specific beads.
7. The microfluidic cartridge of any of the foregoing claims 6 and following, wherein the target-specific beads are pre-functionalized with a binding agent that is specific for one or more targets of interest.
8. The microfluidic cartridge of any of the foregoing claims 7 and following, wherein the pre-functionalized beads are bound to the surface-attached microposts using a functional group linker.
9. The microfluidic cartridge of any of the foregoing claims 7 and following, wherein the pre-functionalized beads are bound to the surface-attached microposts via nonspecific adsorption of the beads to the microposts.
10. The microfluidic cartridge of any of the foregoing claims 7 and following, wherein the pre-functionalized beads are bound to the surface-attached microposts using a lyophilization process.
11. The microfluidic cartridge of any of the foregoing claims, wherein a chemical reaction is used to adhere a magnetically-responsive bead to the surface of a micropost.

12. The microfluidic cartridge of any of the foregoing claims 9 and following, wherein the chemical bonding reaction is selected from a group consisting of an avidin/biotin complexation interaction or a carboxy group/amine linkage.
13. The microfluidic cartridge of any of the foregoing claims, wherein a remnant (latent) magnetic field is generated in the surface-attached microposts, thereby attracting and binding the beads to the microposts via magnetism.
14. The microfluidic cartridge of any of the foregoing claims, wherein the beads are bound to at least one substrate surface of the reaction chamber by an ambient magnetic field.
15. The microfluidics cartridge of claim 1, where the bead comprises a core that is covered by a polymer shell, wherein the polymer shell provides a surface for a subsequent functionalization reaction or reactions.
16. The microfluidics cartridge of claim 15, wherein the core comprises a magnetically-responsive material.
17. The microfluidics cartridge of claim 15, wherein the polymer shell is selected from the group consisting of a polystyrene or a silica-based material.
18. An instrument comprising:
 - a. an actuation mechanism, and
 - b. the microfluidic cartridge of any of the foregoing claims,
wherein the actuation mechanism generates an actuation force thereby compelling at least a portion of the magnetically-responsive microposts to move.
19. The instrument any of claims 12 and following, wherein the surface-attached microposts are functionalized with a plurality of beads for specific binding of one or more targets of interest.
20. The instrument any of claims 12 and following, wherein the actuation force is selected from the group consisting of a magnetic, thermal, sonic, and/or electric force.
21. The instrument any of claims 12 and following, wherein the microposts are pre-magnetized to create a magnetic field in the microposts and then magnetically-responsive beads are bound to the microposts, whereby the beads provide a surface for binding one or more targets of interest.
22. The instrument of any of the foregoing claims 18 and following, wherein the microposts are maintained in an upright orientation by a lyophilization process.

23. The instrument any of claims 18 and following, wherein the beads comprise a superparamagnetic material.
24. The instrument of claim 18, wherein the bead is pre-coupled with a ligand.
25. The instrument of claim 24, wherein the ligand is selected from the group consisting of an antibody, a protein, an antigen, a DNA/RNA probe, or any other molecule with an affinity for one or more targets of interest.
26. A method of capturing a target, the method comprising:
- a. providing the instrument of any of the foregoing claims 12 and following;
 - b. causing a sample comprising the target to flow through the reaction chamber; and
 - c. causing the actuation mechanism to generate an actuation force thereby compelling at least a portion of the magnetically-responsive microposts to move; thereby contacting the beads attached to the field of microposts and thereby causing the target to bind to the beads.
27. The method of claim 26, further comprising:
- a. causing a wash buffer to flow through the reaction chamber; and
 - b. causing the actuation mechanism to generate an actuation force thereby compelling at least a portion of the magnetically-responsive microposts to move; thereby washing the beads.
28. The method of claim 26, further comprising:
- a. causing an elution buffer to flow through the reaction chamber; and
 - b. causing the actuation mechanism to generate an actuation force thereby compelling at least a portion of the magnetically-responsive microposts to move; thereby eluting the target from the beads.
29. A method of applying beads to a field of surface-attached microposts, the method comprising spraying a composition comprising the beads and a volatile solvent onto a sheet of microposts.
30. The method of claim 29, wherein the volatile solvent is selected from a group consisting of a non-ozone-depleting chlorofluorocarbon (CFC) or one of the alcohols.

31. The method of claim 26, comprising continuing the bead-spraying process for a period of time sufficient to cause the sheet of microposts to be fully layered with beads.
32. The method of claim 26, further comprising dicing the sheet.