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; and

wherein the bead comprises a core that is covered by a polymer shell, the polymer shell provides a surface for a subsequent functionalization reaction or reactions, and the core further comprises a magnetically responsive material.

2. The microfluidic cartridge of claim 1, wherein the reaction chamber further comprises openings arranged for flowing fluid into and out of the chamber, wherein:

a. the housing comprises two substrates separated to form the reaction chamber as a gap between the substrates,

b. the beads are functionalized, and/or

c. the surface-attached microposts comprise magnetically-responsive microposts that can be actuated using a magnetic actuation mechanism.

~~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~~3. The microfluidic cartridge of ~~any of the foregoing claims 4 and following~~claim 1 or claim 2, wherein the beads comprise target-specific beads, wherein the target-specific beads are pre-functionalized with a binding agent that is specific for one or more targets of interest, the pre-functionalized beads are bound to the surface-attached microposts using a functional group linker or using a lyophilization process or via non-specific adsorption of the beads to the microposts, and when using the lyophilization process the microposts are maintained in an upright orientation by the lyophilization process.

~~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~~4. The microfluidic cartridge of any of the ~~foregoing~~ preceding claims, wherein a chemical bonding reaction is used to adhere a magnetically-responsive bead to the surface of a micropost, and optionally wherein the chemical bonding reaction is selected from the group consisting of an avidin/biotin complexation interaction or a carboxy group/amine linkage.

~~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~~5. The microfluidic cartridge of any of the ~~foregoing~~ preceding 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 and/or wherein the beads are bound to at least one substrate surface of the reaction chamber by an ambient magnetic field.

~~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~~6. The microfluidics cartridge of claim ~~15~~1, wherein the polymer shell is selected from the group consisting of a polystyrene or a silica-based material.

~~18~~7. An instrument comprising:

a. an actuation mechanism, and

b. the microfluidic cartridge of any of the ~~foregoing~~ preceding claims,

wherein the actuation mechanism generates an actuation force thereby compelling at least a portion of the magnetically-responsive microposts to move, and

wherein the actuation force is selected from the group consisting of a magnetic, thermal, sonic, and/or electric force.

~~19~~8. The instrument ~~any of claims 12 and following~~of claim 7, 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~~9. The instrument ~~any of claims 12 and following~~ of claim 7 or 8, 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, and optionally wherein the beads comprise a superparamagnetic material.

~~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~~10. The instrument of claim ~~18~~7, wherein the bead is pre-coupled with a ligand, and optionally 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.

~~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~~11. A method of capturing a target, the method comprising:

a. providing the instrument of any of ~~the foregoing~~ claims ~~12 and following~~7-10;

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~~12. The method of claim ~~26~~11, 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~~13. The method of claim ~~26~~11, 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~~14. 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 and further comprising dicing the sheet, and wherein the volatile solvent is selected from a group consisting of a non-ozone-depleting chlorofluorocarbon (CFC) or one of the alcohols.

~~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~~15. The method of claim ~~26~~14, 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.~~