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 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.

4. The microfluidic cartridge of any of the 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.

5. The microfluidic cartridge of any of the 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.

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

7. An instrument comprising:

a. an actuation mechanism, and

b. the microfluidic cartridge of any of the 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.

8. The instrument 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.

9. The instrument 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.

10. The instrument of claim 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.

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

a. providing the instrument of any of claims 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.

12. The method of claim 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.

13. The method of claim 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.

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.

15. The method of claim 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.