What is claimed is:

1. A sequencing kit, comprising:

a flow cell including:

a plurality of chambers;

a layer positioned within each of the plurality of chambers; and

primers attached to the layer within each of the plurality of chambers;

an encapsulation matrix precursor composition at least some of which is in at least some of the chambers and consisting of:

a fluid;

a monomer or polymer including a radical generating and chain elongating functional group;

a radical source; and

a crosslinker; and

a radical initiator as part of the encapsulation matrix precursor composition or as a separate component.

2. The sequencing kit as defined in claim 1, wherein ~~one of~~:

the monomer is selected from the group consisting of acrylamide, N,N'-bis(acryloyl)cystamine, bisacrylamide, diacrylate, diallylamine, triallylamine, divinyl sulfone, ethyleneglycol diallyl ether, ethyleneglycol diacryate, trimethylolpropane trimethacrylate, ethoxylated trimethylol diacrylate, ethoxylated pentaerythritol tetracrylate, a collagen monomer, and combinations thereof; or

the polymer is selected from the group consisting of polyethylene glycol-thiol, polyethylene glycol-acrylate, polyethylene glycol diacrylate, polyethylene glycol, polypropylene oxide, polyacrylic acid, poly(hydroxyethyl methacrylate), poly(methyl methacrylate), poly(N-isopropylacrylamide), poly(lactic acid), poly(lactic-co-glycolic acid), polycaprolactone, poly(vinylsulfonic acid), poly(L-aspartic acid), poly(L-glutamic acid), polylysine, and combinations thereof; or

any combination of the monomer and the polymer are used together.

3. The sequencing kit as defined in claim 1, wherein:

the polymer includes a first polymer and a second polymer;

the first polymer is selected from the group consisting of polyethylene glycol-thiol, polyethylene glycol-acrylate, polyethylene glycol diacrylate, polyethylene glycol, polypropylene oxide, polyacrylic acid, poly(hydroxyethyl methacrylate), poly(methyl methacrylate), poly(N-isopropylacrylamide), poly(lactic acid), poly(lactic-co-glycolic acid), polycaprolactone, poly(vinylsulfonic acid), poly(L-aspartic acid), poly(L-glutamic acid), polylysine, and combinations thereof; and

the second polymer is selected from the group consisting of agar, agarose, alginate, heparin, alginate sulfate, dextran sulfate, hyaluronan, pectin, carrageenan, gelatin, chitosan, cellulose, a collagen polymer, and combinations thereof.

4. The sequencing kit as defined in any of claims 1, 2, or 3, wherein the radical initiator is tetramethylethylenediamine.

5. The sequencing kit as defined in any of claims 1, 2, or 3, wherein the radical initiator is a photoinitiator and is included in the encapsulation matrix precursor composition.

6. The sequencing kit as defined in any of claims 1, 2, 3, 4, or 5, wherein the radical source is selected from the group consisting of potassium persulfate, ammonium persulfate, 4,4′-azobis(4-cyanovaleric acid), 1,1′-azobis(cyclohexanecarbonitrile), azobisisobutyronitrile, 2,2′-azobis(2-methylpropionitrile), 2,2′-azobis(2-methylpropionitrile), peroxide, riboflavin, 3-(dimethylamino)propionitrile, and combinations thereof.

7. The sequencing kit as defined in any of claims 1, 2, 3, 4, 5, or 6, wherein the crosslinker is selected from the group consisting of acrylamide, N,N'-bis(acryloyl)cystamine, bisacrylamide, 1,4-diacroylpiperazine, *N-N'*-diallyl L-tartardiamide, and *N-N'*-(1,2-dihydroxyethylene)-bis-acrylamide.

8. The sequencing kit as defined in any of claims 1, 2, 3, 4, 5, 6, or 7, wherein each chamber has a bottom surface, and wherein the layer is~~primers are attached to~~ a polymer layer across the bottom surface.

9. The sequencing kit as defined in any of claims 1, 2, 3, 4, 5, 6, or 7, wherein each chamber has a bottom surface, and wherein the layer includes~~primers are respectively attached to~~ a plurality of spatially segregated polymer islands positioned on the bottom surface.

10. The sequencing kit as defined in any of claims 1, 2, 3, 4, 5, 6, or 7, wherein each chamber has a bottom surface and a plurality of depressions defined therein, and wherein the layer is~~primers are respectively attached to~~ a polymer layer within each of the depressions.

11. The sequencing kit as defined in any of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10, further comprising a library preparation solution including adapter sequences and transposomes.

12. The sequencing kit as defined in any of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11, further comprising a sample fluid including genetic material.

13. A method, comprising:

introducing a fluid including genetic material to a flow cell including:

a plurality of chambers,~~;~~

a layer positioned within each of the plurality of chambers; and

primers attached to the layer within each of the plurality of chambers;

whereby at least some of the genetic material enters at least some of the plurality of chambers;

removing liquid of the fluid from the flow cell;

introducing an encapsulation matrix precursor composition into the flow cell, the encapsulation matrix precursor composition including:

a monomer or polymer including a radical generating and chain elongating functional group;

a radical source; and

a crosslinker;

whereby at least some of the encapsulation matrix precursor composition enters at least some of the chambers containing the genetic material and attached primers; and

encapsulating the genetic material in a hydrogel matrix in the at least some of the chambers by initiating crosslinking or crosslinking and polymerization of the encapsulation matrix precursor composition contained in the at least some of the chambers.

14. The method as defined in claim 13, wherein the encapsulation matrix precursor composition further includes an ultraviolet radical initiator, and wherein generating the hydrogel matrix is accomplished by exposing the flow cell to ultraviolet radiation.

15. The method as defined in claim 13, wherein the crosslinking or the crosslinking and polymerization of the encapsulation matrix precursor composition contained in the at least some of the chambers is accomplished by introducing a radical initiator into the flow cell.

16. A sequencing kit, comprising:

a flow cell including:

a plurality of chambers;

a layer positioned within each of the plurality of chambers; and

primers attached to the layer within each of the plurality of chambers; and

an encapsulation matrix precursor composition at least some of which is in at least some of the chambers and consisting of:

a fluid; and

a polymer selected from the group consisting of agar, agarose, alginate, heparin, alginate sulfate, dextran sulfate, hyaluronan, pectin, carrageenan, gelatin, chitosan, cellulose, a collagen polymer, and combinations thereof.

17. The sequencing kit as defined in claim 16, wherein the polymer is alginate and the fluid is a calcium-containing solution.

18. The sequencing kit as defined in any of claims 16 or 17, further comprising a library preparation solution including adapter sequences and transposomes.

19. The sequencing kit as defined in any of claims 16, 17, or 18, further comprising a sample fluid including genetic material.

20. A method, comprising:

introducing a fluid including genetic material to a flow cell including:

a plurality of chambers;

a layer positioned within each of the plurality of chambers; and

primers attached to the layer within each of the plurality of chambers;

whereby at least some of the genetic material enters at least some of the plurality of chambers;

introducing an encapsulation matrix precursor composition into the flow cell, the encapsulation matrix precursor composition including:

a fluid; and

a polymer selected from the group consisting of agar, agarose, alginate, heparin, alginate sulfate, dextran sulfate, hyaluronan, pectin, carrageenan, gelatin, chitosan, cellulose, a collagen polymer, and combinations thereof;

whereby at least some of the encapsulation matrix precursor composition enters at least some of the chambers containing the genetic material and the attached primers;

flushing the flow cell with a liquid external immobilization agent at a temperature ranging from ~~about~~ 40°C to ~~about~~ 80°C; and

exposing the flow cell to a gelation temperature of the polymer in the at least some of the chambers, thereby encapsulating the genetic material in a hydrogel matrix in the at least some of the chambers.

21. The method as defined in claim 20, further comprising heating the flow cell to a temperature ranging from ~~about~~ 40°C to ~~about~~ 80°C during the introduction of the fluid and the encapsulation matrix precursor composition and during the flushing.

22. The method as defined in claim 20, wherein exposing the flow cell to the gelation temperature of the polymer involves cooling the flow cell to the gelation temperature and maintaining the flow cell at the gelation temperature for a predetermined time.

23. The method as defined in claim 20, wherein exposing the flow cell to the gelation temperature of the polymer involves heating the flow cell to the gelation temperature and maintaining the flow cell at the gelation temperature for a predetermined time.