4. The method of claim 1, wherein the amplifying is performed in an array of reaction chambers that are operatively coupled to a sensor, wherein the sensor can detect the presence of a nucleotide incorporation byproduct within the reaction chamber.

5. The method of claim 4, wherein the reaction chamber includes a hydrophilic polymer matrix conformally disposed within the reaction chamber.

6. The method of claim 5, wherein the hydrophilic polymer matrix includes a hydrogel polymer matrix or wherein the hydrophilic polymer matrix is a cured-in-place polymer matrix.

7. The method of claim 5, wherein the hydrophilic polymer matrix includes polyacrylamide, copolymers thereof, derivatives thereof, or combinations thereof.

8. The method of claim 7, wherein polyacrylamide is conjugated with an oligonucleotide primer.

9. The method of claim 5, wherein the reaction chamber has a diameter in a range of 0.1 micrometers to 2 micrometers.

10. The method of claim 4, wherein the sensor includes a field effect transistor (FET).

11. The method of claim 10, further including detecting the presence of one or more nucleotide incorporation byproducts at a site of the array using the FET, optionally, further including detecting a pH change occurring within the
at least one reaction chamber using the FET.

12. The method of claim 10, further including introducing a nucleotide into the site; and detecting an output signal from the sensor resulting from incorporation of the nucleotide into a sequencing primer, wherein the output signal is a current-based or a threshold voltage based output signal of the FET.

13. The method of claim 10, wherein the FET includes a floating gate conductor coupled to the reaction chamber.

14. The method of claim 10, wherein the FET includes a floating gate structure comprising a plurality of conductors electrically coupled to one another and separated by dielectric layers, and the floating gate conductor is an uppermost conductor in the plurality of conductors.

15. The method of claim 1, wherein the one or more accessory proteins include a recombinase loading factor or a single stranded binding protein, optionally wherein the recombinase loading factor comprises uvsY from T4 phage and the single stranded binding protein comprises gp32 protein from T4 phage or a modified gp32 protein from T4 phage.

16. The method of any one of the preceding claims, wherein the reaction mixture includes the sieving agent at a concentration of about 0.1 to about 20% weight per volume.

17. The method of any one of the preceding claims, wherein the sieving agent exhibits an average viscosity range of about 5 centipoise to about 15,000 centipoise when dissolved in water at 2 weight percent measured at about 25°C, or about 10 centipoise to about 10,000 centipoise as a 2% aqueous solutions measured at about 25°C, or about 15 centipoise to about 5,000 centipoise as a 2% aqueous solution measured at about 25°C.

18. The method of any one of the preceding claims, wherein the sieving agent comprises a polypeptide, or a polysaccharide polymer, or a polymer of glucose or galactose, or a glucopyranose polymer, or wherein the sieving agent comprises one or more polymers selected from the group consisting of: cellulose, dextran, starch, glycogen, agar, chitin, pectin or agarose.