Claims

1. A method for attaching reaction components to charge sensors, comprising

(a) providing a solid support comprising a plurality of charge sensors, wherein each of the charge sensors is a field effect transistor and has a capacity to attach a plurality of reaction components;

(b) providing a fluid comprising a plurality of reaction components of a particular type;

(c) contacting the solid support with the fluid under conditions wherein

(i) the plurality of reaction components of the particular type are in fluid communication with the plurality of charge sensors,

(ii) a greater number of reaction components of the particular type is in the fluid than the number of charge sensors on the solid support; and

(iii) reaction components of the particular type from the fluid attach to the charge sensors, thereby forming modified charge sensors that are attached to multiple reaction components of the particular type from the fluid; and

(d) removing, degrading or inactivating one or more of the reaction components of the particular type from each of the modified charge sensors to leave a single one of the reaction components of the particular type attached to at least one of the modified charge sensors, wherein one of:

(iv) removing involves cleaving cleavable tethers to which the reaction components are attached; or

(v) degrading involves binding a protection moiety to the single one of the reaction components, and then degrading any non-protected reaction components; or

(vi) inactivating involves binding a chemically or photochemically active oligonucleotide analog to one or more polymerase active sites, and then applying a chemical or photochemical treatment to render the one or more of the reaction components inactive; or

(vii) removing, degrading, or inactivating of the excess reactive components from the charge sensors is monitored to determine the extent of removal, degradation or inactivation; or

(viii) removing, degrading, or inactivating is monitored with a different sensor to distinguish the presence of reaction components at the surface of the reaction components.

2. The method of claim 1, wherein the reaction components or the charge sensors comprise precursors of the cleavable tethers wherein the removing comprises (iv), wherein the cleavable tether is cleaved by photochemical cleavage, electrochemical cleavage, electric field, mechanical agitation, chemical cleavage or heat.

3. The method of claim 1, wherein the type of the reaction components is a nucleic acid enzyme, optionally wherein the nucleic acid enzyme is a polymerase, optionally wherein the reaction component comprises at least two different types of polymerases, wherein the different types of polymerases attach to charge sensors of the solid support and are present on the charge sensors after step (d), optionally wherein the different types of polymerases produce mutually distinguishable signals detectable by the charge sensors when incorporating the same type of nucleotide into a nascent nucleic acid strand.

4. The method of claim 1, wherein the type of the reaction component is selected from the group consisting of a receptor, ligand, nucleic acid and enzyme.

5. The method of claim 1, wherein each of the charge sensors has a capacity to attach greater than two of the reaction components.

6. The method of claim 1, wherein at least 50% of the charge sensors are attached to a single reaction component of the particular type after step (d).

7. The method of claim 1, wherein the reaction components of the particular type are actively transported to the charge sensors by application of an electric field.

8. The method of claim 1, wherein the removing comprises (v), wherein the protection moiety inhibits degradation of the single one of the reaction components of the particular type, optionally (a) further comprising removing the protection moiety from the single one of the reaction components of the particular type after the degrading, or (b) wherein the type of the reaction component is a nucleic acid enzyme and the protection moiety comprises a nucleic acid.

9. The method of claim 1, wherein step (d) comprises (vii) and wherein the method further comprises discontinuing the removing to leave the single one of the reaction components of the particular type attached to each of the modified charge sensors.

10. The method of claim 1, wherein the reaction components of the particular type or the charge sensors comprise precursors of conducting tethers.

11. The method of claim 1, wherein the reaction components of the particular type from the fluid attach to the charge sensors by formation of conducting tethers.

12. The method of claim 10, wherein the conducting tethers comprise doped polythiophene, poly(3,4-ethylenedioxythiophene), polyacetylene, polypyrrole, polyaniline, polyfluorene, polyphenylene, polypyrene, polyazulene, polynaphthalenes, polycarbazole, polyindole, or polyazepine.