WHAT IS CLAIMED IS:

1. A biosensor comprising:

a backside illumination complementary metal-oxide-semiconductor (CMOS) image sensor including:

an electronic circuit layer; and

a photo sensing layer over the electronic circuit layer, wherein the photo sensing layer includes:

a substrate layer, and

a plurality of photodiodes having a first top surface and a first bottom surface, wherein the first bottom surface is in contact with the electronic circuit layer, and wherein the first top surface includes a light receiving surface; a transparent passivation layer on the plurality of photodiodes, the passivation layer having a third top surface and a third bottom surface, the third bottom surface in contact with the first top surface of the plurality of photodiodes;

a metal or metal oxide layer on the passivation layer, wherein the metal or metal oxide layer has a second top surface and a second bottom surface, wherein the metal or metal oxide layer defines a plurality of voids, wherein each void of the plurality of voids is aligned with at least one photodiode of the plurality of photodiodes, and wherein the second top surface is coated or treated with a first material to form a first covering layer;

wherein the metal or metal oxide layer is disposed on the third top surface of the passivation layer to form a plurality of wells in the corresponding plurality of voids, wherein wall(s) of each well are formed from the metal or metal oxide layer, and wherein a bottom of each well is formed from the third top surface of the passivation layer,

wherein the bottom of each well is coated or treated with a second material having a positive charge to form a second covering layer, and

wherein the first material is different than the second material; and

wherein each well is a discrete positively charged area sized and functionalized to receive and retain a nucleic acid macromolecule, wherein the wells are separated by areas that are inert in the sense that DNA macromolecules do not bind such areas; and

wherein the first material is a material that does not bind or adhere to, or is repelled by, the passivation layer; wherein the second material is a material that does not bond to or adhere to the first covering layer.

2. The biosensor of claim 1, wherein the first material includes at least one of phosphate or phosphonic acid.

3. The biosensor of claim 1, wherein the second material includes silane.

4. The biosensor of claim 1, wherein the second material is configured to bind the macromolecules, and wherein the first material is configured not to bind to the macromolecules.

5. The biosensor of claim 4, wherein the second material comprises a ligand that binds the macromolecules.

6. The biosensor of claim 5, wherein the macromolecules are nucleic acids and the ligands are oligonucleotides.

7. The biosensor of claim 1, wherein the first material is hydrophobic.

8. The biosensor of claim 1, wherein at least one well is occupied by a nucleic acid or antibody.

9. A method comprising:

providing a backside illumination complementary metal-oxide-semiconductor (CMOS) image sensor, wherein providing the backside illumination CMOS image sensor includes:

providing an electronic circuit layer; and

providing a photo sensing layer over the electronic circuit layer, wherein the photo sensing layer includes:

a substrate layer; and

a plurality of photodiodes having a first top surface and a first bottom surface, wherein the first bottom surface is in contact with the electronic circuit layer, and wherein the first top surface includes a light receiving surface;

forming a transparent passivation layer on the plurality of photodiodes, the passivation layer having a third top surface and a third bottom surface; the third bottom surface in contact with the first top surface of the plurality of photodiodes

forming a metal or metal oxide layer on the passivation layer, wherein the metal or metal oxide layer has a second top surface and a second bottom surface, wherein the metal or metal oxide layer defines a plurality of voids, wherein each void of the plurality of voids is aligned with at least one photodiode of the plurality of photodiodes, and wherein the second top surface is coated or treated with a first material to form a first covering layer; and

wherein the metal or metal oxide layer is disposed on the third top surface of the passivation layer to form a plurality of wells, wherein wall(s) of each well are formed from the metal or metal oxide layer, and wherein a bottom of each well is formed from the third top surface of the passivation layer,

wherein the bottom of each well is coated or treated with a second material having a positive charge to form a second covering layer, and

wherein the first material is different than the second material; and,

wherein each well is a discrete positively charged area sized and functionalized to receive and retain a nucleic acid macromolecule, wherein the wells are separated by areas that are inert in the sense that DNA macromolecules do not bind such areas, and

wherein the first material is a material that does not bind or adhere to, or is repelled by, the passivation layer; wherein the second material is a material that does not bond to or adhere to the first covering layer.

10. The method of claim 9, further comprising selectively applying the first covering layer to the metal layer or metal oxide layer using the first material that bonds to the metal layer or metal oxide layer and does not bind to the passivation layer.

11. The method of claim 10, wherein the first material includes at least one of phosphate or phosphonic acid.

12. The method of claim 9, further comprising selectively applying the second covering layer to the passivation layer using the second material that bonds to the passivation layer and does not bind to the metal layer or metal oxide layer.

13. The method of claim 12, wherein the second material includes silane or a silane compound.