WHAT IS CLAIMED IS:

1. A photoelectric device comprising:

a light-transmitting first electrode,

a first semiconductor layer comprising n-type TiO_2 and in direct electrical contact with said first electrode,

a second semiconductor layer in direct electrical contact with said first semiconductor layer and comprising p-type light-absorbing quantum dot nanoparticles, and

a second electrode in direct electrical contact with said second semiconductor layer,

said first and second semiconductor layers forming a junction therebetween, at least one side of which is substantially depleted of free electrons and of free holes when said device is not illuminated.

2. The photoelectric device of claim **1** wherein said first semiconductor layer ~~is an n-type electron-accepting layer, and said light-absorbing nanoparticles of said second semiconductor layer are p-type nanoparticles, wherein said n-type electron-accepting layer~~ and said p-type light-absrobing quantum dot nanoparticles have bandgaps of sufficiently different magnitudes to cause said at least one side of said junction to be so depleted.

3. The photoelectric device of claim **2** wherein said bandgap of said ~~n-type electron-accepting~~ first semiconductor layer is greater than said bandgap of said layer of p-type light-absorbing quantum dot nanoparticles by at least 1.5eV.

4. The photoelectric device of claim **2** wherein said bandgap of said ~~n-type electron-accepting~~ first semiconductor layer is greater than said bandgap of said layer of p-type light-absorbing quantum dot nanoparticles by from 1.5eV to 5eV.

5. The photoelectric device of claim **2** wherein said bandgap of said ~~n-type electron-accepting~~ first semiconductor layer is greater than said bandgap of said layer of p-type light-absorbing quantum dot nanoparticles by from 2eV to 5eV.

6. The photoelectric device of claim **1** wherein said p-type light-absorbing quantum dot nanoparticles are colloidal quantum dots.

7. The photoelectric device of claim **1** wherein said p-type light-absorbing quantum dot nanoparticles are metal chalcogenide colloidal quantum dots.

8. The photoelectric device of claim 1 wherein said p-type light-absorbing quantum dot nanoparticles are lead chalcogenide colloidal quantum dots. .

9. The photoelectric device of claim 1 wherein said p-type light-absorbing quantum dot nanoparticles are lead sulfide colloidal quantum dots.

10. The photoelectric device of claim 6 wherein said colloidal quantum dots have a number-average diameter of from 3nm to 6nm.

11. The photoelectric device of claim 1 wherein said light-absorbing quantum dot nanoparticles are nanoparticles comprising a quantum dot core having a surface comprising anions at said surface, a first shell surrounding said quantum dot core and comprising cations that passivate said anions at said core surface, and a second shell surrounding said first shell and comprising anions that passivate any cations present at said core surface and said cations of said first shell.

12. The photoelectric device of claim 11 wherein said quantum dot core is a metal chalcogenide colloidal quantum dot.

13. The photoelectric device of claim 11 wherein said quantum dot core is a metal sulfide colloidal quantum dot.

14. The photoelectric device of claim 11 wherein said quantum dot core is a metal sulfide colloidal quantum dot and said cations of said first shell are a member selected from the group consisting of Cd^{2+}, Pb^{2+}, Zn^{2+}, and Sn^{2+}.

15. The photoelectric device of claim 11 wherein said quantum dot core is a metal sulfide colloidal quantum dot and said cations of said first shell are Cd^{2+}.

16. The photoelectric device of claim 11 wherein said cations of said first shell are Cd^{2+} and said anions of said second shell are a member selected from the group consisting of halogen ions and thiocyanate ion.

17. The photoelectric device of claim 11 wherein said quantum dot core is a metal sulfide colloidal quantum dot, said cations of said first shell are Cd^{2+}, and said anions of said second shell are halogen ions.

18. The photoelectric device of claim **11** wherein said quantum dot core is a metal sulfide colloidal quantum dot, said cations of said first shell are Cd^{2+}, and said anions of said second shell are bromine ions.

~~19. The photoelectric device of claim 2 wherein said n-type electron-accepting layer is titanium dioxide.~~

~~20~~19. The photoelectric device of claim **1** wherein said light-transmitting first electrode is a member selected from the group consisting of aluminum oxide, zinc oxide, indium tin oxide, and fluorine-doped tin oxide.

~~21~~20. The photoelectric device of claim **1** wherein said light-transmitting first electrode is fluorine-doped tin oxide.

~~22~~21. The photoelectric device of claim **1** wherein said second electrode is a member selected from the group consisting of nickel, lithium fluoride, platinum, palladium, silver, gold, copper, and alloys of silver, gold, and copper.

~~23~~22. The photoelectric device of claim **1** wherein said second electrode is gold.

~~24~~23. A nanoparticle comprising:

a quantum dot core;

a first shell comprising cations that substantially surround said quantum dot core; and

a second shell comprising anions that substantially surround said first shell, wherein the ratio of anions to cations is approximately 1:1.

~~25~~24. The nanoparticle of claim ~~24~~ 23 wherein said quantum dot core is a metal chalcogenide colloidal quantum dot.

~~26~~25. The nanoparticle of claim ~~24~~ 23 wherein said quantum dot core is a metal sulfide colloidal quantum dot.

~~27~~26. The nanoparticle of claim ~~24~~ 23 wherein said quantum dot core is a metal sulfide colloidal quantum dot and said cations of said first shell are a member selected from the group consisting of Cd^{2+}, Pb^{2+}, Zn^{2+}, and Sn^{2+}.

~~28~~27. The nanoparticle of claim ~~24~~23 wherein said quantum dot core is a metal sulfide colloidal quantum dot and said cations of said first shell are Cd^{2+}.

~~29~~28. The nanoparticle of claim ~~24~~23 wherein said quantum dot core is a metal sulfide colloidal quantum dot and said cations of said first shell are Cd^{2+} and said anions of said second shell are a member selected from the group consisting of halogen ions and thiocyanate ion.

~~30~~29. The nanoparticle of claim ~~24~~23 wherein said quantum dot core is a metal sulfide colloidal quantum dot, said cations of said first shell are Cd^{2+}, and said anions of said second shell are halogen ions.

~~31~~30. The nanoparticle of claim ~~24~~23 wherein said quantum dot core is a metal sulfide colloidal quantum dot, said cations of said first shell are Cd^{2+}, and said anions of said second shell are bromine ions.

~~32~~31. A photoelectric device comprising:

a light-transmitting first electrode,

a first semiconductor layer in direct electrical contact with said first electrode,

a second semiconductor layer in direct electrical contact with said first semiconductor layer and comprising light-absorbing nanoparticles, each said nanoparticle comprising a quantum dot core, a first shell comprising cations that substantially surround said quantum dot core, and a second shell comprising anions that substantially surround said first shell, wherein the ratio of anions to cations is approximately 1:1, and

a second electrode in direct electrical contact with said second semiconductor layer.

~~33~~32. The photoelectric device of claim ~~32~~31 wherein said quantum dot core is a metal chalcogenide colloidal quantum dot.

~~34~~33. The photoelectric device of claim ~~32~~31 wherein said quantum dot core is a metal sulfide colloidal quantum dot.

~~35~~34. The photoelectric device of claim ~~32~~ 31 wherein said quantum dot core is a metal sulfide colloidal quantum dot and said cations of said first shell are a member selected from the group consisting of Cd^{2+}, Pb^{2+}, Zn^{2+}, and Sn^{2+}.

~~36~~35. The photoelectric device of claim ~~32~~ 31 wherein said quantum dot core is a metal sulfide colloidal quantum dot and said cations of said first shell are Cd^{2+}.

~~37~~36. The photoelectric device of claim ~~32~~ 31 wherein said cations of said first shell are Cd^{2+} and said anions of said second shell are a member selected from the group consisting of halogen ions and thiocyanate ion.

~~38~~37. The photoelectric device of claim ~~32~~ 31 wherein said quantum dot core is a metal sulfide colloidal quantum dot, said cations of said first shell are Cd^{2+}, and said anions of said second shell are halogen ions.

~~39~~38. The photoelectric device of claim ~~32~~ 31 wherein said quantum dot core is a metal sulfide colloidal quantum dot, said cations of said first shell are Cd^{2+}, and said anions of said second shell are bromine ions.

~~40~~39. The photoelectric device of claim ~~32~~ 31 wherein said first semiconductor layer is titanium dioxide.

~~41~~40. The photoelectric device of claim ~~32~~ 31 wherein said light-transmitting first electrode is a member selected from the group consisting of aluminum oxide, zinc oxide, indium tin oxide, and fluorine-doped tin oxide, and said second electrode is a member selected from the group consisting of nickel, lithium fluoride, platinum, palladium, silver, gold, copper, and alloys of silver, gold, and copper.

~~42~~41. The photoelectric device of claim ~~32~~ 31 wherein said light-transmitting first electrode is fluorine-doped tin oxide, and said second electrode is gold.

~~43~~42. A method of forming passivated p-type semiconductor nanoparticles, said method comprising:

(a) treating p-type semiconductor colloidal quantum dots having surface anions with a solution of a cation-containing reagent that passivates said surface anions to form colloidal quantum dots coated with said cations, and

(b) treating said colloidal quantum dots so coated with a solution of an anion-containing reagent that passivates said cations, wherein the ratio of passivating anions to cations is approximately 1:1.

4443. The method of claim ~~43~~ 42 said p-type semiconductor colloidal quantum dots are metal chalcogenide colloidal quantum dots.

4544. The method of claim ~~43~~ 42 said p-type semiconductor colloidal quantum dots are metal sulfide colloidal quantum dots.

4645. The method of claim ~~43~~ 42 said p-type semiconductor colloidal quantum dots are lead sulfide colloidal quantum dots.

4746. The method of claim ~~43~~ 42 said cation of said cation-containing reagent is a member selected from the group consisting of Cd^{2+}, Pb^{2+}, Zn^{2+}, and Sn^{2+}.

4847. The method of claim ~~43~~ 42 said cation of said cation-containing reagent is Cd^{2+}.

4948. The method of claim ~~43~~ 42 said anion of said anion-containing reagent is a member selected from the group consisting of halogen ions and thiocyanate ion.

5049. The method of claim ~~43~~ 42 said cation-containing reagent is cadmium(II) chloride-tetradecylphosphonic acid-oleylamine.

5150. The method of claim ~~43~~ 42 said anion of said anion-containing reagent is a member selected from the group consisting of halogen ions and thiocyanate ion.

5251. The method of claim ~~43~~ 42 said anion of said anion-containing reagent is a halogen ion.

5352. The method of claim ~~43~~ 42 said anion of said anion-containing reagent is a bromine ion

5453. The method of claim ~~43~~ 42 said anion-containing reagent is a member selected from the group consisting of cetyltrimethylammonium bromide, hexatrimethylammonium chloride, tetrabutylammonium iodide, and tetrabutylammonium thiocyanate.