What is claimed is:

1. A method of forming graphene, comprising:

providing a graphite sample having atomic layers of carbon with spaces in between;

immersing the graphite sample in an electrolytic solution of propylene carbonate and lithium perchlorate;

performing electrolysis on the immersed graphite sample to introduce organic complexes of lithium ions and propylene carbonate into the spaces between the atomic layers to form intercalated graphite;

subjecting the intercalated graphite to a thermal treatment that expands the space between the atomic layers to form expanded graphite; and

separating the atomic layers using sonication to form one or more sheets of graphene.

2. The method of claim 1, including forming the graphene as one or more flakes of graphene or one or more sheets of graphene derivatives.

3. The method of claim 1, wherein the graphite sample is selected from the group of graphite samples comprising: natural graphite, graphite minerals, synthetic graphite, highly oriented pyrolytic graphite (HOPG), graphite fiber, graphite rods, and graphite powder.

4. The method of claim 1, further comprising:

combining the graphene with quantum dots to form a heterojunction configured to function as an active component in a photovoltaic device.

5. The method of claim 4, wherein said combining includes performing at least one of:

a sol-gel process, a hot-injection process, a chemical vapor deposition process, a nanocluster deposition process, and a sputtering process.

6. The method of claim 4, wherein said combining includes asymmetric deposition of different nanocrystals on difference sides of the one or more graphene sheets.

7. The method of claim 6, further comprising:

providing a hydrophobic/hydrophilic solution environment with the graphene as a surfactant interface;

providing hydrophobic and hydrophilic precursors so as to form at least one of nanocrystals, particles and polymer; and

depositing at least one of the nanocrystals, particles and polymer on the surfactant interface.

8. The method of claim 4, including providing the quantum dots as chalcogenide semiconductor nanocrystals.

9. The method of claim 1, further comprising dispersing the one or more graphene sheets in an organic solvent.

10. The method of claim 1, further comprising forming providing on opposite sides of the one or more sheets of graphene different nano-metals or semiconductor nanocrystals to form a graphene-based asymmetric heterojunction.

11. The method of claim 10, further comprising forming the graphene-based asymmetric heterojunction as CdTe/graphene/PbS-TiO_2 or CdSe/graphene/PbS-TiO_2.

12. The method of claim 1, further comprising:

applying the graphene to a flexible, non-conducting substrate to form a flexible, conducting substrate.

13. A method of forming graphene from a graphite sample comprising a lattice of carbon atoms that define atomic layers and a layer spacing, comprising:

intercalating propylene carbonate and lithium perchlorate into the carbon atom lattice via direct-current electrolysis of a 30 to 50 mg/ml solution of the lithium perchlorate in the propylene carbonate at a voltage of 15V+/-5V to form intercalated graphite;

expanding the layer spacing by subjecting the intercalated graphite to a thermal process to form expanded graphite; and

mechanically exfoliating one or more carbon atomic layers from the expanded graphite to form the graphene.

14. The method of claim 13, including forming the graphene as one or more flakes of graphene or one or more sheets of graphene derivatives.

15. The method of claim 13, further comprising:

employing the graphene in a bioanalytical technique involving biomolecules to selectively extract or pre-concentrate the biomolecules.

16. The method of claim 15, further comprising:

using the selectively extracted or pre-concentrated biomolecules as a substrate for SELDI for directly analyzing the biomolecules without mixing with an organic matrix.

17. The method of claim 13, where the biomolecules include at least one of: one or more proteins, DNA and RNA.

18. The method of claim 13, further comprising combining the graphene with chalcogenide semiconductor nanocrystals to form a heterojunction.

19. The method of claim 13, further comprising forming a photovoltaic device from the graphene by:

using the graphene, forming a solar cell active layer comprising a graphene/nanocrystal junction, the solar cell active layer having first and second sides;

forming an anode on the first side of the solar cell active layer; and

forming a cathode on the second side of the solar cell active layer.

20. The method of claim 1, wherein performing the electrolysis includes employing two electrodes, wherein the graphite sample is employed as one of the electrodes and a graphite rod is used as the other electrode.

21. The method of claim 1, wherein the thermal treatment includes heating the intercalated graphite using a flow of a heated inert gas.

22. The method of claim 1, wherein the electrolytic solution contains 30-50 mg/ml of the lithium perchlorate.

23. The method of claim 13, wherein the thermal process includes heating the intercalated graphite using a flow of a heated inert gas.