

The claims defining the invention are as follows:

1. A dispersible graphene platelet including:
 - a base layer of graphene;
 - at least one discontinuous graphene layer stacked on the base layer;wherein the at least one discontinuous layer has a smaller surface area than the base layer; and,
wherein the edge regions of the base layer and the at least one discontinuous layer are at least partially functionalised.
2. The platelet according to claim 1, wherein the platelet is able to form a stable dispersion in water at concentrations up to 700 mg/mL.
3. The platelet according to either claim 1 or 2, wherein the electrical conductivity of the platelet is approximately 900 S/cm.
4. The platelet according to any one of claims 1 to 3, wherein the platelet is further functionalised by the addition of metal ions to at least one of the functionalised edges or the surface.
5. The platelet according to claim 4, wherein the metal ions are selected from Fe, Cu, Co, and Sn.
6. A polymer-matrix composite material comprising
 - a polymer; and
 - graphene platelets according to any one of claims 1 to 5.
7. The polymer-matrix composite material according to claim 6 wherein the polymer is selected from alginate, chitosan, PVA, PEG, PU, PEI, PVDF, PDMS or PEDOT PSS.
8. An electrode for electrochemical processes comprising;
 - graphene platelets according to any one of claims 1 to 5; and
 - a binder.

9. An electrode according to claim 8 wherein the binder is selected from Nafion and PVDF.
10. A method for producing an electrode according to either claim 8 or 9, comprising:
 - creating a mixture containing graphene platelets according to any one of claims 1 to 5 and a binder; and
 - coating the mixture onto an electrode substrate.
11. A method for producing dispersible graphene platelets including the steps of:
 - a. suspending graphite or graphene in a solution containing an organic nitrile (such as acetonitrile), an ester (such as ethyl acetate) and water; and,
 - b. reacting the solution containing suspended graphite or graphene with an oxidant (such as ruthenium tetroxide) to at least partially functionalise edge regions of the graphite or graphene.
12. The method according to claim 11, further comprising the step of:
 - cooling the resultant solution obtained in step b. in an ice bath.
13. The method according to either claim 11 or 12, further comprising the step of:
 - homogenising the resultant solution obtained in step b.
14. The method according to claim 13, wherein the homogenisation is conducted at 20000 rpm up to 2 hours.
15. The method according to any one of claims 11 to 14, further comprising the step of:
 - ultrasonicated the resultant solution obtained in step b.
16. The method according to any one of claims 11 to 15, further comprising the step of:
 - filtering the resultant solution obtained in step b to produce a filtered solid.
17. The method according to claim 16, further comprising the step of:
 - washing the filtered solid.

18. The method according to claim 17, wherein washing includes washing the filtered solid with HCl and water.
19. The method according to claim 18, wherein the filtered solid is washed with HCl until a filtrate produced by washing the filtered solid is colourless and then with water until the filtrate is neutral.
20. The method according to any one of claims 17 or 18, wherein the filtered solid is washed with an organic solvent such as ethanol or acetone.
21. The method according to any one of claims 16 to 20, wherein the filtered solid is dried in vacuo to produce a dried powder.
22. The method according to any one of claims 16 to 20, wherein the filtered solid is freeze dried to produce a dried powder.
23. The method according to either claim 21 or 22, wherein the dried powder is dispersed in water and sonicated for up to 30 minutes, and a resulting mixture is allowed to settle for up to 48 hours to produce a solid and a supernatant, and decanting and filtering the supernatant to produce a graphene powder.
24. The method according to claim 23, wherein the graphene powder is washed with an organic solvent and dried.
25. The method according to either claim 23 or 24 wherein the dried powder is dispersed in water and sonicated for up to 30 minutes, and a resulting mixture is centrifuged to produce a solid and a supernatant.
26. The method according to any one of claims 11 to 25, wherein the oxidant is ruthenium tetroxide.

27. The method according to claim 26, wherein the ruthenium tetroxide is provided via the reaction of sodium periodate with ruthenium chloride added to the solution containing suspended graphene or graphite.
28. The method according to any one of claims 11 to 27, wherein the graphene or graphite is provided in the form of expanded graphite with an increased interlayer spacing.
29. The method according to any one of claims 21 to 25, wherein the filtered solid is then dispersed in a solution containing metal ions to bind metal ions to at least one of a surface or a functionalised edge of the platelet.
30. The method according to claim 29, where the metal ions are selected from Fe, Cu, Co, and Sn.
31. A dispersible graphene platelet according to any one of claims 1 to 5, produced by a method according to any one of claims 11 to 30.
32. A method for producing dispersible graphene platelets including the steps of: suspending graphite or graphene in a solution; and, contacting the solution containing suspended graphite or graphene with an oxidant to at least partially functionalise edge regions of the graphite or graphene.