CLAIMS

1. A method for producing a transition metal nitride/~~carbon~~ graphene composite, the method including:

heating at least one transition metal ion precursor and at least one organic amine under reflux in an alcohol solvent, the heating being for obtaining at least one transition metal chelate; and

loading the at least one transition metal chelate onto a graphene oxide layer to form the transition metal nitride/~~carbon~~ graphene composite;

wherein the graphene oxide is decorated with oxygen containing functional groups, the oxygen containing groups being selecting from a group consisting of: carboxylic acids, phenols, lactones, carboxylic anhydrates, ketones, ethers, pyrones, and quinines.

2. The method as claimed in claim 1, further including annealing the transition metal nitride/~~carbon~~ graphene composite at a predetermined temperature under inert gas conditions, the predetermined temperature being between 550^0C and 1050^0C.

3. The method as claimed in either claim 1 or 2, wherein the transition metal nitride is selected from a salt of a group consisting of: iron (Fe), cobalt (Co), zinc (Zn), and nickel (Ni).

4. The method as claimed in any one of claims 1 to 3, further including reduction of graphene oxide via chemical exfoliation of graphite.

~~5. The method as claimed in any one of claims 1 to 4, wherein the graphene oxide is decorated with oxygen containing functional groups, the oxygen containing groups being selecting from a group consisting of: carboxylic acids, phenols, lactones, carboxylic anhydrates, ketones, ethers, pyrones, and quinines.~~

~~6~~5. The method as claimed in any one of claims 1 to ~~4~~5, further including washing the transition metal nitride/~~carbon~~graphene composite in diluted acid, de-ionised water and ethanol to remove excessive iron oxide, the diluted acid being 1M of sulphuric acid.

~~7~~6. The method as claimed in any one of claims 1 to ~~5~~6, wherein the at least one organic amine is ethylene di-amine, and wherein the alcohol solvent is either ethanol or methanol.

~~8. A transition metal nitride/carbon composite as produced using the method as claimed in any one of claims 1 to 7.~~

~~9. The transition metal nitride/carbon composite as claimed in claim 8 being used in applications selected from a group consisting of: an anode in a Li-ion battery, a fuel cell catalyst, and a lithium-air battery cathode.~~

~~10. The transition metal nitride/carbon composite as claimed in claim 9, wherein a gravimetric capacity of the composite is higher than a gravimetric capacity of graphite when the composite is used as the anode.~~

~~11. The transition metal nitride/carbon composite as claimed in claim 9, wherein the gravimetric capacity of the composite increases during repeated charging cycles when the composite is used as the anode.~~

~~12. A Li-ion battery using the transition metal nitride/carbon composite as claimed in claim 8, the transition metal nitride/carbon composite being used as an anode in the battery.~~

~~13. A lithium-air battery using the transition metal nitride/carbon composite as claimed in claim 8, the transition metal nitride/carbon composite being used as a cathode in the battery.~~

~~14. A fuel cell using the transition metal nitride/carbon composite as claimed in claim 8, the transition metal nitride/carbon composite being used as a cathode in the fuel cell.~~