CLAIMS

1. A method of forming one or more composite structures, the method comprising:

   forming one or more carbon structures from a carbon source via a hydrothermal process; and

   introducing iron onto the one or more carbon structures to form the one or more composite structures comprising carbon and one or more nanostructures comprising iron;

   wherein forming the one or more carbon structures from the carbon source further comprises introducing a seeding additive to the carbon source, the seeding additive being a potassium salt or a phosphate salt; and

   wherein introducing iron onto the one or more carbon structures to form the one or more composite structures comprises:

      dissolving an iron salt in a suitable solvent to form a precursor solution;

      mixing the precursor solution and a suspension comprising the one or more carbon structures to form a resultant mixture;

      drying the resultant mixture comprising the iron salt and the one or more carbon structures; and

      adding an anti-agglomeration additive to the resultant mixture before drying the resultant mixture such that each nanostructure of the one or more nanostructures is less than 20 nm.

2. The method according to claim 1,

   wherein each carbon structure of the one or more carbon structures is a carbon particle.

3. The method according to claim 1 or claim 2,

   wherein the carbon source is a biomass material.

4. The method according to claim 3,

wherein the biomass material is any one selected from a group consisting of D-(+)-glucose, D-(+)-glucosamine hydrochloride, and combination thereof.

5. The method according to any one of claims 1 to 4,

wherein the seeding additive is monopotassium phosphate.

6. The method according to any one of claims 1 to 5,

wherein introducing the seeding additive to the carbon source comprises:

forming a solution comprising the carbon source; and

adding the seeding additive to the solution comprising the carbon source.

7. The method according to any one of clams 1 to 6,

wherein the seeding additive is any one value selected from a range from 0.1% to 10% by weight relative to the carbon source.

8. The method according to any one of claims 1 to 7,

wherein the hydrothermal process is carried out at any temperature range from 180 °C to 210 °C.

9. The method according to any one of claims 1 to 8,

wherein iron comprised in the one or more composite structures is any one value selected from a range from 1% to 80% by weight relative to carbon comprised in the one or more composite structures.

10. The method according to any one of claims 1 to 9,

wherein the anti-agglomeration additive is any one selected from a group consisting of glucosamine, melamine, and a combination thereof.

11. The method according to any one of claims 1 to 10,

wherein the anti-agglomeration additive is any one value selected from a range from 1% to 50% by weight relative to carbon particles.

12. The method according to any one of claims 1 to 11,

wherein introducing iron into the one or more carbon structures to form the one or more composite structures further comprises:

reducing the iron salt by heating the resultant mixture in a pyrolysis process.

13. The method according to claim 12,

wherein the resultant mixture is heated in an environment of any one selected from a group consisting of nitrogen, argon, and a mixture of hydrogen and nitrogen.

14. The method according to claim 13,

wherein the resultant mixture is heated in an environment of the mixture of hydrogen and nitrogen; and

wherein hydrogen is any one value from 1 % to 10 % by volume relative to nitrogen.

15. The method according to claim 14,

wherein hydrogen is 5% by volume relative to nitrogen.

16. The method according to any one of claims 12 to 15,

wherein a temperature of the pyrolysis process is any one value selected from a range from 500 °C to 900 °C.

17. A composite structure formed according to any one of claims 1 to 16.