Summary

There is provided a method of preparing carbon particles, comprising the steps of:

(a) treating a mixture comprising (i) an inorganic salt and (ii) a solution comprising a carbon source hydrothermally to form a solution of carbon particles; and

(b) collecting the carbon particles from the solution of the treating step (a).

In one aspect, there is provided a method of preparing carbon particles, comprising the steps of:

(a1) acidifying a solution comprising a carbon source, a base and a solvent;

(a2) mixing an inorganic salt and the solution of the acidifying step (a1) to form a mixture;

(a) treating the mixture of the mixing step (a2) hydrothermally to form a solution of carbon particles; and

(b) collecting the carbon particles from the solution of the treating step (a).

In another aspect, there is provided carbon particles prepared from the method as described herein.

Advantageously, the carbon particles may have high absorption towards ions, particularly metal cations due to a presence of carboxylic acid moieties and hydroxyl moieties on a surface.

There is provided a method of preparing a composite material, comprising the steps of:

(a) forming a dispersion comprising carbon particles, a metal precursor, an amino additive and a solvent;

(b) drying the dispersion of the forming step (a) to form a dried powder; and

(c) heating the dried power of the drying step (b) in an atmosphere comprising an inert gas to obtain the composite material.

Advantageously, the amino additive may function as a binder to bind the carbon particles together during the heating step (c). The amino additive may also help to distribute the metal precursor more uniformly in the dispersion. Therefore, when the metal precursor is converted to metal particles during the heating step (c), the metal particles are distributed in the composite material more uniformly as well. Where the carbon particles are spherical, some metal particles may be embedded into a porous carbon out layer of the carbon particles and some metal particles may be allocated in an interstitial space between carbon particles (which may be regarded as carbon linkers between the carbon particles).

There is provided a composite material comprising a carbon support and a plurality of metal particles, wherein the metal particles are disposed within the carbon support.

Advantageously, the composite material may have high oxygen scavenging properties. This is because of a uniform distribution of Fe^0 in the carbon support with high Fe^0 content.

There is provided a composite material prepared by the method as described herein.

There is provided an article comprising the composite material as described herein.

Definitions

The following words and terms used herein shall have the meaning indicated:

The word “substantially” does not exclude “completely” e.g. a composition which is “substantially free” from Y may be completely free from Y. Where necessary, the word “substantially” may be omitted from the definition of the invention.

Unless specified otherwise, the terms "comprising" and "comprise", and grammatical variants thereof, are intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, unrecited elements.

The term "about" as used herein typically means +/- 5 % of the stated value, more typically +/- 4 % of the stated value, more typically +/- 3 % of the stated value, more typically, +/- 2 % of the stated value, even more typically +/- 1 % of the stated value, and even more typically +/- 0.5 % of the stated value.

Throughout this disclosure, certain embodiments may be disclosed in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosed ranges. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

Certain embodiments may also be described broadly and generically herein. Each of the narrower species and subgeneric groupings falling within the generic disclosure also form part of the disclosure. This includes the generic description of the embodiments with a proviso or negative limitation removing any subject matter from the genus, regardless of whether or not the excised material is specifically recited herein.

Detailed Disclosure of Embodiments

Exemplary, non-limiting embodiments of a method of preparing carbon particles will now be disclosed.

Claims

1. A method of preparing carbon particles, comprising the steps of:
(a1) acidifying a solution comprising a carbon source, a base and a solvent;
(a2) mixing an inorganic salt and the solution of the acidifying step (a1) to form a mixture;
(a) treating the mixture of the mixing step (a2) hydrothermally to form a solution of carbon particles; and
(b) collecting the carbon particles from the solution of the treating step (a).

2. The method of claim 1, wherein the solution of the acidifying step (a1) further comprises an additive.

3. The method of claim 1 or 2, wherein the carbon source of the acidifying step (a1) is derived from a biomass material.

4. The method of claim 3, wherein the biomass material is lignin or glucose.

5. The method of any one of claims 1 to 4, wherein the treating step (a) is undertaken at a temperature in the range of 150 ℃ to 220 ℃.

6. The method of any one of claims 1 to 5, further comprising a step of adjusting a pH value of the solution of the treating step (a) after the treating step (a) but before the collecting step (b).

7. Carbon particles prepared from the method of any one of claims 1 to 6.