Claims

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1. A carbon-based composite material comprising a matrixcarbon film and structural carbon; wherein the carbon film is carried on a surface of the matrix, the carbon film is connected to the structural carbon, and the matrix, the carbon film, as well as structural carbon are formed as an integral structure, wherein the carbon film has an average thickness in a range of 0.001 nm to 1 mm, and the carbon film continuously or discontinuously covers the matrix; wherein the structural carbon has any shape and structure; wherein the carbon based composite material has any shape and structure; a surface area thereof is in the range of 0.001square nanometers to 1,000,000,000 square meters; wherein the carbon film and structural carbon comprises carbon elements, alkali metal elements, and/or alkaline earth metal elements; and wherein the carbon film as well as the structural carbon further optionally comprises elements other than the carbon elements, alkali metal elements, and the alkali earth metal elements.
2. The carbon-based composite material according to claim 1, wherein the matrix material is a solid material at room temperature except organic matter; the shape of the substrate is not limited, comprising particle, fiber, film, plate, block, solid, hollow, porous, interworking hole, porous net and woven net and other shapes; wherein the surface area of non-organic material that is solid at room temperature is in the range of 0.001 square nanometers to 1,000,000,000 square meters.
3. The carbon-based composite material according to claim 1, wherein the carbon film comprises carbon element and at least one additional element other than carbon, wherein the content of alkali metal elements and/or alkaline earth elements is in the range of 0.0000000000001wt% - 99.99wt% by mass and the content of other elements is in the range of 0.0000000000001wt% - 99.99wt% of by mass and the other elements comprises any element other than carbon; and wherein the carbon film has a thickness is the range of 0.001nm-1mm; and continuously or discontinuously covers the matrix.
4. The carbon-based composite material according to claim 1, wherein the structural carbon comprises carbon elements and at least one additional element other than the carbon, wherein the content of alkali metal and/or alkaline earth metals is in the range of 0.0000000000001wt% - 99.99wt%by mass, and the content of other elements is in the range of , 0.0000000000001wt% - 99.99wt% by mass, and the other elements comprises any element other than carbon; and wherein the structural carbon has any shape and structure.
5. The carbon-based composite material according to claim 1, wherein the carbon film and the

structural carbon modify solid materials or physical and chemical properties that are conductive or non-conductive, and the carbon-based composite material having desired physical as well as chemical properties is prepared by adjusting the structure and properties of the carbon film and the structural carbon.

6. A preparation method of carbon-based composite material according to any one of claims 1-5, comprising the steps of:

(A1) applying a catalyst mixture to a surface of the matrix and drying under predetermined conditions;

(A2) subjecting a matrix or the matrix carrying the catalyst mixture to temperature control at any temperature in the range of -50-1500℃, placing the matrix into a heating furnace and maintaining for 0 to 1,000 hours, wherein the present step serves to decompose, melt, uniformly mix, or penetrate the catalyst mixture into the matrix, thereby facilitating formation in the next step of a carbon film and structural carbon on the matrix surface which possess a uniform thickness and high consistency in structural topography;

(A3) adjusting atmosphere in the heating furnace and setting the heating furnace to a reaction temperature in the range of -50-1500℃, optionally adjusting temperature in the heating furnace as needed introducing a carbon-containing organic substance into heating furnace, and performing a temperature control for 0-1000 hours; wherein the carbon-containing organic substance reacts under the action of the catalyst in the atmosphere to produce the carbon film covering the matrix and the structural carbon formed on the surface of the carbon film;

(A4) stopping temperature control, optionally adjusting the atmosphere in the heating furnace and cooling to a temperature in the range of -50-100℃ to obtain the carbon-based composite material comprising the steps of:

(B1) after applying the catalyst mixture to a surface of the matrix and drying, applying the carbon-containing organic substance onto the matrix to prepare a reaction precursor, or mixing the catalyst mixture with the matrix and then mixing with the carbon-containing organic substance to prepare the reaction precursor;

(B2) placing the reaction precursor into a heating furnace under a predetermined atmosphere, controlling the temperature at any temperature in a range of -50°C to 1500°C and maintaining for 0 to 1000 hours, thereby producing the carbon film covering the matrix and the structural carbon formed on a surface of the carbon film;

(B3) stopping the temperature control, optionally adjusting the atmosphere in the heating furnace, and cooling to a temperature in a range of -50°C to 100°C to obtain the carbon-based composite material;

wherein in step (B1), for a particulate matrix, it is particularly suitable to mix the catalyst mixture with the matrix and the carbon-containing organic substance to prepare the reaction precursor, and for a film, plate, or block, it is particularly suitable to apply the catalyst mixture to the surface of the matrix and then apply the carbon-containing organic substance onto the matrix to prepare the reaction precursor; and wherein

the atmosphere in steps (B2) and (B3) is adjusted according to the actual reaction process, and the atmospheres between successive steps may be consistent or inconsistent, and when atmospheres are consistent between successive steps, the atmosphere adjustment in subsequent steps may be omitted.

7. The method for preparing the carbon-based composite material according to claim 6, wherein at least one feasible method is employed such that the catalyst or the catalyst mixture continuously or discontinuously covers the matrix, and wherein the covering method comprises spraying, dipping, draw coating, blade coating, brushing, flow coating, wiping, roller coating, printing, as well as digital printing.
8. The method for preparing the carbon-based composite material according to claim 6, wherein the catalyst comprises at least one of a simple substance, an organic compound or an inorganic compound of alkali metal or alkaline earth metal, or a mixture thereof, and wherein the alkali metals as well as alkaline earth metals include all alkali metal and alkaline earth metal elements.
9. The preparation method of carbon-based composite materials according to claim 6, wherein the catalyst mixture comprises a solution, suspension, paste or powder in which at least one catalyst is uniformly dispersed, and wherein a mass fraction of the catalyst is in the range of 0.00000001wt%-99wt%.
10. The method for preparing the carbon-based composite material according to claim 6, wherein the catalyst mixture optionally comprises an additive, a surfactant, and a thickener, the additive comprising any compound which is used for controlling the topography of the structural carbon and for preparing at least one carbon-based composite material, and wherein a mass fraction of each of the additive, the surfactant and the thickener is in a range

of 0 to 99.000000000%.

11. The method for preparing the carbon-based composite material according to claim 6, wherein the carbon-containing organic substance comprises at least one selected from the group consisting of alcohols, organic acids, olefins, alkanes, alkynes, ketones, various carbon-containing gases, saccharides, and various resins, or comprises a mixture thereof.

12. The carbon-based composite material according to any one of claims 1 to 5, wherein the application fields comprise binder-free positive and negative electrodes of primary and secondary batteries, positive and negative electrode materials for batteries, binder-free capacitor electrodes and capacitor electrode materials, sensors, solar cell electrodes and materials, electrodes for hydrogen production by water electrolysis, catalysts and catalyst carriers, hydrogen storage, reinforcement materials, conductive materials, field emission material, electromagnetic wave absorbing and radiating materials as well as heat-conductive and heat-dissipating materials.