a Rate (3R) of the rhombohedral graphite layer (3R) and the hexagonal graphite layer (2H), based on an X-ray diffraction method, which is defined by following Equation 1 is 31% or more:

$$\text{Rate (3R)} = P3/(P3+P4)\times 100 \quad \cdots\cdots \text{ Equation 1}$$

wherein

P3 is a peak intensity count over a first degree range of a (101) plane of the rhombohedral graphite layer (3R) based on the X-ray diffraction method, and

P4 is a peak intensity count over a second degree range of a (101) plane of the hexagonal graphite layer (2H) based on the X-ray diffraction method.

According to the features, since a large amount of the rhombohedral graphite layer (3R) from which a layer is easily exfoliated is included therein, a graphite-based carbon material useful as a graphene precursor, from which graphene is easily exfoliated when the graphite-based carbon material is useful as a precursor, and which makes it possible to disperse graphene at a high concentration or to a high degree can be obtained.

{0009}

The graphene precursor in an embodiment of the invention is characterized in that the Rate (3R) is 40% or more.

According to the feature, as long as the Rate (3R) is 40% or more, a graphite-based carbon material useful as a graphene precursor from which graphene is more easily exfoliated,

compared with cases where the Rate (3R) is 31% or more and less than 40%, can easily be obtained.

{0010}

The graphene precursor in an embodiment of the invention is characterized in that the Rate (3R) is 50% or more.

According to the feature, as long as the Rate (3R) is 50% or more, a graphite-based carbon material useful as a graphene precursor from which graphene is more easily exfoliated, compared with cases where the Rate (3R) is 40% or more and less than 50%, can easily be obtained.

{0011}

The graphene precursor in an embodiment of the invention is characterized in that an intensity ratio P1/P2 of the hexagonal graphite layer (2H) based on the X-ray diffraction method is 0.01 or more, wherein

P1 is a peak intensity count over a third degree range of a (100) plane of the hexagonal graphite layer (2H) based on the X-ray diffraction method, and

P2 is a peak intensity count over a fourth degree range of a (002) plane of the hexagonal graphite layer (2H) based on the X-ray diffraction method.

According to the feature, when the intensity ratio P1/P2 of the hexagonal graphite layer (2H) is made 0.01 or more, the orientation disorder of crystal structure of carbon material will be higher, graphene is easily exfoliated, and the

According to the feature, by combining a treatment based on a radiowave force by microwaves, millimeter waves, plasma, electromagnetic induction heating (IH), magnetic fields or the like, and a treatment based on a physical force by a ball mill, a jet mill, a centrifugal force, supercriticality or the like, a graphite-based carbon material useful as a graphene precursor, which more easily separates into graphene, compared with use of either one of the treatments, can be obtained in a short time.

{0014}

An embodiment of the present invention provides a method of producing a graphene precursor comprising a graphite-based carbon material wherein the above-described natural graphite material has at least a hexagonal graphite layer (2H), and an intensity ratio P1/P2 of the hexagonal graphite layer (2H) based on the X-ray diffraction method is less than 0.01, wherein

P1 is a peak intensity count over the third degree range of a (100) plane of the hexagonal graphite layer (2H) based on the X-ray diffraction method, and

P2 is a peak intensity count over the fourth degree range of a (002) plane of the hexagonal graphite layer (2H) based on the X-ray diffraction method.

According to the features, the carbon material can be produced from easily-available natural graphite of which the orientation disorder of crystal structure of carbon material is lower and general.

{0015}

CLAIMS

Claim 1

A graphene precursor comprising a graphite-based carbon material, the graphite-based carbon material having a rhombohedral graphite layer and a hexagonal graphite layer, wherein a Rate of the rhombohedral graphite layer and the hexagonal graphite layer, based on an X-ray diffraction method, which is defined by following Equation 1 is 31% or more:

$$Rate = P3/(P3+P4)\times 100 \cdots\cdots \text{Equation 1}$$

wherein

P3 is a peak intensity count over a first degree range of a (101) plane of the rhombohedral graphite layer based on the X-ray diffraction method, and

P4 is a peak intensity count over a second degree range of a (101) plane of the hexagonal graphite layer based on the X-ray diffraction method.

Claim 2

The graphene precursor according to claim 1, wherein the Rate is 40% or more.

Claim 3

The graphene precursor according to claim 1, wherein the Rate is 50% or more.

Claim 4

The graphene precursor according to claim 1, wherein an intensity ratio P1/P2 of the hexagonal graphite layer based on the X-ray diffraction method is 0.01 or more, wherein

P1 is a peak intensity count over a third degree range of a (100) plane of the hexagonal graphite layer based on the X-ray diffraction method, and

P2 is a peak intensity count over a fourth degree range of a (002) plane of the hexagonal graphite layer based on the X-ray diffraction method.

Claim 5

The graphene precursor according to claim 1, wherein the graphite-based carbon material is produced by carrying out a radiowave-force-based treatment and a physical-force-based treatment in a vacuum or in the air.

Claim 6

A method of producing the graphene precursor comprising a graphite-based carbon material according to claim 1, comprising: carrying out a radiowave-force-based treatment and a physical-force-based treatment to a natural graphite material in a vacuum or in the air.

Claim 7

A method of producing the graphene precursor comprising a graphite-based carbon material, wherein the natural graphite material as set forth in claim 6 has at least a hexagonal graphite layer, and an intensity ratio P1/P2 of the hexagonal graphite layer based on the X-ray diffraction method is less than 0.01, wherein

P1 is a peak intensity count over the third degree range of a (100) plane of the hexagonal graphite layer based on the X-ray diffraction method, and

P2 is a peak intensity count over the fourth degree range of a (002) plane of the hexagonal graphite layer based on the X-ray diffraction method.