[0004]

Discharge devices have a request for raising energy to inject and increasing generation amounts of atmospheric ions, radicals, and charged corpuscle liquids including atmospheric ions and radicals (atmospheric ions, radicals, and charged corpuscle liquids are hereinafter collectively referred to as "active components"), and a request for suppressing ozone production at this time. However, it is difficult for the conventional discharge devices to satisfy both of the two requests.

[0005]

Embodiments of the present disclosure propose a discharge device that can increase generation amounts of active components and suppress an increase in ozone at this time, and a method for manufacturing the same.

[0006]

The discharge device of an aspect includes a discharge electrode, a voltage application unit that applies a voltage to the discharge electrode to produce discharge that has further developed from corona discharge in the discharge electrode, an opposite electrode positioned facing the discharge electrode. The discharge electrode is configured to receive higher energy than corona discharge to produce a discharge path in which dielectric breakdown occurs so as to extend around from the discharge electrode, wherein the discharge electrode is configured to produce the discharge path in which dielectric breakdown occurs to connect between the discharge electrode and the opposite electrode, and

wherein the opposite electrode includes a needle-shaped electrode part facing the discharge electrode,

.

[0007]

By producing such high-energy discharge, generation amounts of active components can be increased as compared with corona discharge, and an increase in ozone can be suppressed.

[0007a] According to an aspect, there is a discharge device comprising:

a discharge electrode;

a voltage application unit that applies a voltage to the discharge electrode to produce discharge that has further developed from corona discharge in the discharge electrode;

an opposite electrode positioned facing the discharge electrode,

wherein the discharge electrode is configured to produce a discharge path in which dielectric breakdown occurs so as to extend around from the discharge electrode,

wherein the discharge electrode is configured to produce the discharge path in which dielectric breakdown occurs to connect between the discharge electrode and the opposite electrode, and

, wherein

the opposite electrode includes:

at least one acute protruding surface facing the discharge electrode; and

an opposite surface facing the discharge electrode, and

the opposite surface has a flat surface, a concave surface, or a shape in which the flat surface and the concave surface are combined.

[0008]

The discharge device of the present disclosure produces effects of increasing generation amounts of active components and suppressing an

CLAIMS

1. A discharge device comprising:

a discharge electrode;

a voltage application unit that applies a voltage to the discharge electrode to produce discharge that has further developed from corona discharge in the discharge electrode;

an opposite electrode positioned facing the discharge electrode,

wherein the discharge electrode is configured to receive higher energy than corona discharge to produce a discharge path in which dielectric breakdown occurs so as to extend around from the discharge electrode,

wherein the discharge electrode is configured to produce the discharge path in which dielectric breakdown occurs to connect between the discharge electrode and the opposite electrode, and

wherein the opposite electrode includes a needle-shaped electrode part facing the discharge electrode.

2. The discharge device according to claim 1, further comprising a liquid supply unit that supplies liquid to the discharge electrode, wherein the liquid supplied to the discharge electrode is electrostatically atomized by the discharge.

3. The discharge device according to claim 1, wherein

the needle-shaped electrode part includes a distal end portion and a proximal end portion on opposite sides,

the discharge electrode has an axial direction, and

a distance between the distal end portion and the discharge electrode in the axial direction is smaller than a distance between the proximal end portion and the discharge electrode in the axial direction.

4. The discharge device according to claim 3, wherein

the opposite electrode includes:

a supporting electrode part held in a posture orthogonal to the axial direction; and

a step portion that lies between the supporting electrode part and the needle-shaped electrode part, and

a distance between the proximal end portion and the discharge electrode in the axial direction is larger than a distance between the supporting electrode part and the discharge electrode in the axial direction.

5. The discharge device according to any one of claims 1 to 4, wherein

the needle-shaped electrode part includes a groove part for inhibiting deformation of the needle-shaped electrode part, and

the groove part is formed by a portion of the needle-shaped electrode part bending in a thickness direction of the needle-shaped electrode part.

6. The discharge device according to claim 1, wherein

the opposite electrode further includes a supporting electrode part that supports the needle-shaped electrode part, and

the needle-shaped electrode part and the supporting electrode part are members of materials different from each other.

7. The discharge device according to any one of claims 1 to 6, wherein

the opposite electrode includes a plurality of the needle-shaped electrode parts.

8. The discharge device according to claim 7, wherein the distal end portion of each of the plurality of needle-shaped electrode parts is positioned on an identical circle.

9. The discharge device according to claim 8, wherein the distal end portion of each of the plurality of needle-shaped electrode parts is equally spaced from each other in a circumferential direction of the identical circle.

10. The discharge device according to any one of claims 7 to 9, wherein each of the plurality of needle-shaped electrode parts includes a distal end portion having a rounded shape.

11. The discharge device according to any one of claims 7 to 10, wherein

each of the plurality of needle-shaped electrode parts is a piece-shaped electrode part having a thickness, and

in an edge portion of a thickness direction of each of the plurality of needle-shaped electrode parts, a portion close to the discharge electrode is chamfered.

12. The discharge device according to any one of claims 7 to 11, wherein the plurality of needle-shaped electrode parts is three or more needle-shaped electrode parts spaced from each other.

13. The discharge device according to claim 12, wherein

the opposite electrode further includes an opening in which the three or more needle-shaped electrode parts are disposed, and

an opening area of the opening is larger than a total area of the three or more needle-shaped electrode parts.

14. A discharge device comprising:

a discharge electrode;

a voltage application unit that applies a voltage to the discharge electrode to produce discharge that has further developed from corona discharge in the discharge electrode;

an opposite electrode positioned facing the discharge electrode,

wherein the discharge electrode is configured to produce a discharge path in which dielectric breakdown occurs so as to extend around from the discharge electrode,

wherein the discharge electrode is configured to produce the discharge path in which dielectric breakdown occurs to connect between the discharge electrode and the opposite electrode, and

, wherein

the opposite electrode includes:

at least one acute protruding surface facing the discharge electrode; and

an opposite surface facing the discharge electrode, and

the opposite surface has a flat surface, a concave surface, or a shape in which the flat surface and the concave surface are combined.

15. The discharge device according to any one of claims 1 to 14, further comprising a capacitor that is electrically connected in parallel to the voltage application unit.

16. A method for manufacturing the discharge device according to claim 11, the method comprising crushing the edge portion of the thickness direction of each of the plurality of needle-shaped electrode parts at one time on one surface of a mold device to perform the chamfering.