CLAIMS

[Claim 1]

An atmospheric pressure remote plasma CVD apparatus, comprising a dielectric chamber having a gas inlet, an internal space, and a plasma outlet, and a plasma generator which generates plasma in the internal space, wherein the atmospheric pressure remote plasma CVD apparatus is provided with a conductor which can be arranged in, inserted into, and removed from the internal space, and wherein the conductor comprises an insulation sheath which extends from the gas inlet of the dielectric chamber.

[Claim 2]

The atmospheric pressure remote plasma CVD apparatus according to claim 1, wherein the plasma outlet comprises a nozzle having an opening area smaller than an average cross-sectional area of a cross-section orthogonal to a gas flow direction of the internal space.

[Claim 3]

The atmospheric pressure remote plasma CVD apparatus according to claim 1 or 2, wherein the dielectric chamber is tubular, and in the longitudinal direction of the dielectric chamber, the gas inlet is arranged at one end of the dielectric chamber and the plasma outlet is arranged at the other end of the dielectric chamber.

[Claim 4]

The atmospheric pressure remote plasma CVD apparatus according to claim 1, 2 or 3, wherein the dielectric chamber comprises at least one selected from the group consisting of glass, quartz, and a fluororesin.

[Claim 5]

The atmospheric pressure remote plasma CVD apparatus according to any one of claims 1 to 4, wherein the plasma generator is a microwave irradiation device.

[Claim 6]

The atmospheric pressure remote plasma CVD apparatus according to any one of claims 2 to 5, wherein the opening area of the nozzle is 0.01 to 0.1 times the average cross-sectional area of the cross-section orthogonal to the gas flow direction of the internal space.

[Claim 7]

The atmospheric pressure remote plasma CVD apparatus according to any one of claims 1 to 6, further comprising a raw material gas supply line which is open in an upstream part, middle part, or downstream part of the internal space, wherein a plasma-excited carrier gas and a raw material gas are mixed in the internal space.

[Claim 8]

The atmospheric pressure remote plasma CVD apparatus according to any one of claims 1 to 7, comprising a raw material supply mechanism for introducing a fluororesin or hydrocarbon thermosetting resin rod-shaped object into the internal space.

[Claim 9]

The atmospheric pressure remote plasma CVD apparatus according to any one of claims 1 to 8, further comprising a conductor which is arranged downstream of the plasma outlet and to which a negative voltage can be applied, wherein the conductor is configured so that a substrate is arranged between the plasma outlet and the conductor.

[Claim 10]

The atmospheric pressure remote plasma CVD apparatus according to any one of claims 1 to 9, wherein the dielectric chamber has a plurality of plasma outlets, and a total opening area of the nozzles of the plurality of plasma outlets is less than the average cross-sectional area of the cross-section orthogonal to the gas flow direction of the internal space.

[Claim 11]

A method for forming a coating on a surface of a substrate, comprising:

providing an atmospheric pressure remote plasma CVD apparatus comprising a dielectric chamber having a gas inlet, an internal space, and a plasma outlet, and a plasma generator which generates plasma in the internal space, the plasma outlet comprising a nozzle having an opening area smaller than an average cross-sectional area of a cross-section orthogonal to a gas flow direction of the internal space,

arranging a substrate downstream of the plasma outlet,

introducing a carrier gas from the gas inlet,

turning the carrier gas into a plasma in the internal space,

introducing a raw material gas from the gas inlet,

mixing the raw material gas and the plasma-excited carrier gas to generate a plasma-excited raw material gas, and

ejecting the plasma-excited raw material gas from the plasma outlet toward the substrate to form a coating on the surface of the substrate,

wherein the atmospheric pressure remote plasma CVD apparatus further comprises a conductor which can be arranged in, inserted into, and removed from the internal space, and wherein the conductor comprises an insulation sheath which extends from the gas inlet of the dielectric chamber.

[Claim 12]

The method according to claim 11, wherein the substrate is a plastic bottle, and the plasma-excited raw material gas is ejected from the plasma outlet toward an interior of the plastic bottle to form a coating on an inner surface of the plastic bottle, thereby producing a plastic bottle having a coated inner surface.