

MEANS FOR SOLVING THE PROBLEMS

[0009] In an exemplary embodiment, a plasma processing apparatus includes a processing vessel having a processing space formed therein; a mounting table provided within the processing space, and configured to mount a processing target object thereon; a dielectric member, disposed at the processing vessel to close the processing space, having an internal space and communication holes through which the internal space is allowed to communicate with the processing space; a first electrode and a second electrode provided within the dielectric member and arranged to face each other with the internal space therebetween; a first gas supply device configured to supply a first processing gas for a plasma process into the internal space; a first high frequency power supply configured to supply a first high frequency power to at least one of the first electrode and the second electrode to generate a first plasma of the first processing gas supplied into the internal space; a depressurizing device configured to depressurize the processing space to introduce the first processing gas and radicals in the first plasma into the processing space from the internal space through the communication holes; a second high frequency power supply configured to supply a second high frequency power to the mounting table to generate a second plasma of the first processing gas introduced into the processing space and to attract ions in the second plasma into the processing target object; and a control unit configured to adjust, by controlling a total amount of the first high frequency power supplied to the first electrode and the first high frequency power supplied to the second electrode, an amount of the radicals in the first plasma introduced into the processing space from the internal space through the communication holes and adjust, by the radicals, an amount of radicals in the second plasma, and configured to adjust, by controlling a ratio between the first high frequency power supplied to the first electrode and the first high frequency power supplied to the second electrode, an amount of electrons in the first plasma introduced into the processing space from the internal space through the communication holes and adjust, by the electrons, an amount of the ions in the second plasma.

[0009a] In another exemplary embodiment, a plasma processing method performed in a plasma processing apparatus including a processing vessel having a processing space formed therein; a mounting table provided within the processing space, and configured to mount a processing target object thereon; a dielectric member, disposed at the processing vessel to close the processing space, having an internal space and communication holes through which the internal space is allowed to communicate with the processing space; a first electrode and a second electrode provided within the dielectric member and arranged to face each other with the internal space therebetween; a first gas supply device configured to supply a first processing gas for a plasma process into the internal space; a first high frequency power supply configured to supply a first high frequency power to at least one of the first electrode and the second electrode to generate a first plasma of the first processing gas supplied into the internal space; a depressurizing device configured to depressurize the processing space and, thus, introduce the first processing gas and radicals in the first plasma into the processing space from the internal space through the communication holes; a second high frequency power supply configured to supply a second high frequency power to the mounting table to generate a second plasma of the first processing gas introduced into the processing space and to attract ions in the second plasma into the processing target object, the plasma processing method comprising: adjusting an amount of the radicals in the first plasma introduced into the processing space from the internal space through the communication holes and adjusting, by these radicals, an amount of radicals in the second plasma by controlling a total amount of the first high frequency power supplied to the first electrode and the first high frequency power supplied to the second electrode; and adjusting an amount of electrons in the first plasma introduced into the processing space from the internal space through the communication holes and adjusting, by these electrons, an amount of ions in the second plasma by controlling a ratio between the first high frequency power supplied to the first electrode and the first high frequency power supplied to the second electrode.