DESCRIPTION

Title of Invention

PLASMA PROCESSING METHOD AND PLASMA PROCESSING APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a national phase of PCT application No. PCT/JP2015/064495, filed on 20 May 2015, which claims priority from Japanese patent application Nos. 2014-114336 and 2014-206666, filed on 2 June 2014 and 7 October 2014, respectively, all of which are incorporated herein by reference.

Technical Field

[0001]

Various aspects and exemplary embodiments of the present disclosure relate to a plasma processing method and a plasma processing apparatus.

Background

[0002]

In a semiconductor manufacturing process, a plasma processing apparatus that performs a plasma processing for the purpose of, for example, deposition or etching of a thin film has been widely used. The plasma processing apparatus may be, for example, a plasma chemical vapor deposition (CVD) apparatus that performs a deposition processing of a thin film, or a plasma etching apparatus that performs an etching processing.

[0003]

Meanwhile, in the plasma processing apparatus, a member (hereinafter, properly referred to as an "in-chamber member") arranged within a chamber is exposed to the plasma of a processing gas during various plasma processings, and thus is required to have a plasma resistance. In this respect, for example, Patent Document 1 discloses that, before a workpiece is subjected to a plasma processing, a silicon-containing gas that contains oxygen is supplied at an oxygen-to-SiF_4 gas flow rate ratio of 1.7 or more to form a fluorine-containing silicon oxide film as a protective film on a

[0007]

A plasma processing method according to an aspect of the present disclosure includes a film forming step, a plasma processing step, and a removal step. In the film forming step, a silicon oxide film is formed on the surface of a member within a chamber by the plasma of an oxygen-containing gas and a silicon-containing gas at a flow rate ratio of the oxygen-containing gas to the silicon-containing gas of 0.2 to 1.4. In the plasma processing step, after the formation of the silicon oxide film on the surface of the member, a workpiece carried into the chamber is subjected to a plasma processing by the plasma of a processing gas. In the removal step, after carrying the plasma-processed workpiece out of the chamber, the silicon oxide film is removed from the surface of the member by the plasma of a fluorine-containing gas.

[0007b] According to another aspect of the present invention, there is provided a plasma processing method comprising: a film forming step of forming a carbon-silicon-containing film on a surface of a member within a chamber by plasma of a carbon-containing gas, an oxygen-containing gas and a silicon-containing gas in which a flow rate ratio of the oxygen-containing gas to the silicon-containing gas ranges from 0.2 to 1.4; a plasma processing step of performing a plasma processing a workpiece carried into the chamber by plasma of a processing gas after the carbon-silicon-containing film is formed on the surface of the member; and a removal step of removing the carbon-silicon-containing film from the surface of the member by plasma of an oxygen-fluorine-containing gas after the workpiece that has been subjected to the plasma processing is carried out of the chamber.

[0007c] According to yet another aspect of the present invention, there is provided a plasma processing apparatus comprising: a chamber where a plasma processing is performed on a workpiece; an exhaust unit configured to decompress an inside of the chamber; a gas supply unit configured to supply a processing gas into the chamber; and a controller configured to execute: a film forming step of forming a silicon oxide film on a surface of a member within the chamber by plasma of an oxygen-containing gas and a silicon-containing gas in which a flow rate ratio of the oxygen-containing gas to

the silicon-containing gas ranges from 0.2 to 1.4; a plasma processing step of performing a plasma processing the workpiece carried into the chamber by plasma of the processing gas after the silicon oxide film is formed on the surface of the member; and a removal step of removing the silicon oxide film from the surface of the member by plasma of a fluorine-containing gas after the workpiece that has been subjected to the plasma processing is carried out of the chamber.

Effects of the Invention

[0008]

According to various aspects and exemplary embodiments of the present disclosure, a plasma processing method and a plasma processing apparatus are realized in which a member within a chamber is protected from plasma, and is suppressed from being deteriorated and worn.

Brief Description of the Drawings

[0009]

FIG. 1 is a schematic sectional view illustrating a plasma processing apparatus applied to a plasma processing method according to the present exemplary embodiment.

FIG. 2 is a flow chart illustrating an example of a processing flow of the plasma