electrode provided in the chuck device, a chuck power supply electrically connected to the single-pole type electrode; and a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber, and a plasma generation portion which generates plasma of the plasma generation. An object to be processed is arranged on the chuck device, wherein the chuck power supply applies a voltage to the single-pole type electrode while the plasma is being generated inside the vacuum chamber and the object to be processed is processed by the plasma while the object to be processed is being chucked by the chuck device. The plasma generation portion is arranged away from the-single pole type electrode; an insulating substrate is used as the object to be processed; and a chuck voltage which periodically changes between a positive voltage and a negative voltage is applied from the chuck power supply to the single-pole type electrode.

The present invention is the vacuum processing device of which a groove is formed in a surface of the chuck device, and a thermally conductive gas supply device for supplying a thermally conductive gas to the groove is connected to the groove.

The present invention is the vacuum processing device of which the chuck power supply is set so as to output the chuck voltage in which a time of application of the positive voltage

is equal to or less than a time of application of the negative voltage.

The present invention is the vacuum processing device of which the chuck power supply is set so as to output the positive voltage for at least one second.

The present invention is a vacuum processing method using a vacuum processing device which includes a vacuum chamber connected to a ground potential, a vacuum evacuation device connected to the vacuum chamber, a chuck device arranged inside the vacuum chamber, a single-pole type electrode provided in the chuck device, a chuck power supply electrically connected to the single-pole type electrode, a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber, and a plasma generation portion which generates plasma of the plasma generation gas; and the plasma generation portion is arranged away from the single-pole type electrode, the method including the steps of arranging an object to be processed on the chuck device, while chucking the object to be processed to the chuck device by generating the plasma inside the vacuum chamber and outputting a voltage from the chuck power supply to the single-pole type electrode, and processing the object to be processed by the plasma. The method further comprising the steps of using an insulating substrate as the object to be

gallium nitride (GaN), quartz (SiO_2), silicon carbide (SiC), zinc selenide (ZnSe) or zinc oxide (ZnO) can be used. An insulating substrate covered with a thin film of aluminum gallium arsenide (AlGaAs), gallium arsenide phosphorus (GaAsP), indium gallium nitride (InGaN), aluminum gallium nitride (AlGaAs), gallium phosphide (GaP) or aluminum indium gallium phosphide (AlGaInP) can also be used.

The interior of the vacuum chamber 11 and the interior of the plasma generation container 34 are vacuum evacuated by the vacuum evacuation device 19, and its vacuum ambience is maintained.

The substrate raising and lowering control device 17 is started up to have the substrate raising and lowering element 18 protrude above the chuck device 40. While the vacuum ambience inside the vacuum processing device 1 is being maintained, the object to be processed 6 is transferred into the vacuum chamber 11, and is placed onto the substrate raising and lowering element 18. The substrate raising and lowering control device 17 is started and the object to be processed 6 is lowered together with the substrate raising and lowering element 18; and the object to be processed 6 is placed onto the dielectric layer 5.

In order to chuck the object to be processed 6 to the chuck device 40, the chuck power supply 16 is started up; and

SCOPE OF CLAIMS

1. A vacuum processing device, comprising:

a vacuum chamber connected to a ground potential;

a vacuum evacuation device connected to the vacuum chamber;

a chuck device arranged inside the vacuum chamber;

a single-pole type electrode provided in the chuck device;

a chuck power supply electrically connected to the single-pole type electrode;

a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber; and

a plasma generation portion which generates plasma of the plasma generation,

wherein an object to be processed is arranged on the chuck device, the chuck power supply applying a voltage to the single-pole type electrode while the plasma is being generated inside the vacuum chamber and the object to be processed is processed by the plasma while the object to be processed is being chucked by the chuck device,

wherein the plasma generation portion is arranged away from the-single pole type electrode,

wherein an insulating substrate is used as the object to be processed, and

wherein a chuck voltage, which periodically changes between a positive voltage and a negative voltage, is applied from the chuck power supply to the single-pole type electrode.

2. The vacuum processing device according to claim 1,

wherein a groove is formed in a surface of the chuck device, and

wherein a thermally conductive gas supply device for supplying a thermally conductive gas to the groove is connected to the groove.

3. The vacuum processing device according claim 1 or 2,

wherein the chuck power supply is set so as to output the chuck voltage in which a time of application of the positive voltage is at most a time of application of the negative voltage.

4. The vacuum processing device according to claim 3, wherein the chuck power supply is set so as to output the positive voltage for at least one second.

5. A vacuum processing method using a vacuum processing device which includes:

a vacuum chamber connected to a ground potential,

a vacuum evacuation device connected to the vacuum chamber,

a chuck device arranged inside the vacuum chamber,

a single-pole type electrode provided in the chuck device,

a chuck power supply electrically connected to the single-pole type electrode,

a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber, and

a plasma generation portion which generates plasma of the plasma generation gas, and

in which the plasma generation portion is arranged away from the single-pole type electrode,

the method comprising the steps of:

arranging an object to be processed on the chuck device; and

while chucking the object to be processed to the chuck device by generating the plasma inside the vacuum chamber and by outputting a voltage from the chuck power supply to the single-pole type electrode,

processing the object to be processed by the plasma,

the method further comprising the steps of:

using an insulating substrate as the object to be processed; and

chucking the object to be processed to the chuck device by making the object to be processed in contact with the plasma and by outputting the chuck voltage which periodically changes between a positive voltage and a negative voltage from the chuck power supply so as to apply the chuck voltage to the single-pole type electrode.

6. The vacuum processing method according to claim 5, wherein the insulating substrate is sapphire.

7. The vacuum processing method according to claim 5 or 6, wherein the chuck voltage is set to a time of application of the positive voltage is at most a time of application of the negative voltage.

8. The vacuum processing method according to claim 7, wherein the time of application of the positive voltage is at least one second.

9. The vacuum processing method according to any one of claims 5 to 8,

wherein, when the object to be processed is processed in vacuum by the plasma, a thermally conductive gas is introduced between a surface of the chuck device and the insulating substrate.

electrode provided in the chuck device, a chuck power supply electrically connected to the single-pole type electrode; and a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber, and a plasma generation portion which generates plasma of the plasma generation. An object to be processed is arranged on the chuck device, wherein the chuck power supply applies a voltage to the single-pole type electrode while the plasma is being generated inside the vacuum chamber and the object to be processed is processed by the plasma while the object to be processed is being chucked by the chuck device. The plasma generation portion is arranged away from the-single pole type electrode; an insulating substrate is used as the object to be processed; and the chuck voltage which periodically changes between a positive voltage and a negative voltage is applied from the chuck power supply to the single-pole type electrode.

The present invention is the vacuum processing device of which a groove is formed in a surface of the chuck device, and a thermally conductive gas supply device for supplying a thermally conductive gas to the groove is connected to the groove.

The present invention is the vacuum processing device of which the chuck power supply is set so as to output the chuck voltage in which a time of application of the positive voltage

is equal to or less than a time of application of the negative voltage.

The present invention is the vacuum processing device of which the chuck power supply is set so as to output the positive voltage for at least one second.

The present invention is a vacuum processing method using a vacuum processing device which includes a vacuum chamber connected to a ground potential, a vacuum evacuation device connected to the vacuum chamber, a chuck device arranged inside the vacuum chamber, a single-pole type electrode provided in the chuck device, a chuck power supply electrically connected to the single-pole type electrode, a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber, and a plasma generation portion which generates plasma of the plasma generation gas; and the plasma generation portion is arranged away from the single-pole type electrode, the method including the steps of arranging an object to be processed on the chuck device, while chucking the object to be processed to the chuck device by generating the plasma inside the vacuum chamber and outputting a chuck voltage from the chuck power supply to the single-pole type electrode, and processing the object to be processed by the plasma. The method further comprising the steps of using an insulating substrate as the object to be

gallium nitride (GaN), quartz (SiO_2), silicon carbide (SiC), zinc selenide (ZnSe) or zinc oxide (ZnO) can be used. An insulating substrate covered with a thin film of aluminum gallium arsenide (AlGaAs), gallium arsenide phosphorus (GaAsP), indium gallium nitride (InGaN), aluminum gallium nitride (AlGaN), gallium phosphide (GaP) or aluminum indium gallium phosphide (AlGaInP) can also be used.

The interior of the vacuum chamber 11 and the interior of the plasma generation container 34 are vacuum evacuated by the vacuum evacuation device 19, and its vacuum ambience is maintained.

The substrate raising and lowering control device 17 is started up to have the substrate raising and lowering element 18 protrude above the chuck device 40. While the vacuum ambience inside the vacuum processing device 1 is being maintained, the object to be processed 6 is transferred into the vacuum chamber 11, and is placed onto the substrate raising and lowering element 18. The substrate raising and lowering control device 17 is started and the object to be processed 6 is lowered together with the substrate raising and lowering element 18; and the object to be processed 6 is placed onto the dielectric layer 5.

In order to chuck the object to be processed 6 to the chuck device 40, the chuck power supply 16 is started up; and

SCOPE OF CLAIMS

1. A vacuum processing device, comprising:

a vacuum chamber connected to a ground potential;

a vacuum evacuation device connected to the vacuum chamber;

a chuck device arranged inside the vacuum chamber;

a single-pole type electrode provided in the chuck device;

a chuck power supply electrically connected to the single-pole type electrode;

a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber; and

a plasma generation portion which generates plasma of the plasma generation,

wherein an object to be processed is arranged on the chuck device, the chuck power supply applying a chuck voltage to the single-pole type electrode while the plasma is being generated inside the vacuum chamber and the object to be processed is processed by the plasma while the object to be processed is being chucked by the chuck device,

wherein the plasma generation portion is arranged away from the-single pole type electrode,

wherein an insulating substrate is used as the object to be processed, and

wherein the chuck voltage, which periodically changes between a positive voltage and a negative voltage, is applied from the chuck power supply to the single-pole type electrode.

2. The vacuum processing device according to claim 1,

wherein a groove is formed in a surface of the chuck device, and

wherein a thermally conductive gas supply device for supplying a thermally conductive gas to the groove is connected to the groove.

3. The vacuum processing device according claim 1 or 2,

wherein the chuck power supply is set so as to output the chuck voltage in which a time of application of the positive voltage is at most a time of application of the negative voltage.

4. The vacuum processing device according to claim 3, wherein the chuck power supply is set so as to output the positive voltage for at least one second.

5. A vacuum processing method using a vacuum processing device which includes:

a vacuum chamber connected to a ground potential,

a vacuum evacuation device connected to the vacuum chamber,

a chuck device arranged inside the vacuum chamber,

a single-pole type electrode provided in the chuck device,

a chuck power supply electrically connected to the single-pole type electrode,

a plasma generation gas introduction device for introducing a plasma generation gas into the vacuum chamber, and

a plasma generation portion which generates plasma of the plasma generation gas, and

in which the plasma generation portion is arranged away from the single-pole type electrode,

the method comprising the steps of:

arranging an object to be processed on the chuck device; and

while chucking the object to be processed to the chuck device by generating the plasma inside the vacuum chamber and by outputting a chuck voltage from the chuck power supply to the single-pole type electrode,

processing the object to be processed by the plasma,

the method further comprising the steps of:

using an insulating substrate as the object to be processed; and

chucking the object to be processed to the chuck device by making the object to be processed in contact with the plasma and by outputting the chuck voltage which periodically changes between a positive voltage and a negative voltage from the chuck power supply so as to apply the chuck voltage to the single-pole type electrode.

6. The vacuum processing method according to claim 5, wherein the insulating substrate is sapphire.

7. The vacuum processing method according to claim 5 or 6, wherein the chuck voltage is set to a time of application of the positive voltage is at most a time of application of the negative voltage.

8. The vacuum processing method according to claim 7, wherein the time of application of the positive voltage is at least one second.

9. The vacuum processing method according to any one of claims 5 to 8,

wherein, when the object to be processed is processed in vacuum by the plasma, a thermally conductive gas is introduced between a surface of the chuck device and the insulating substrate.