

CLAIMS

WHAT IS CLAIMED IS:

1. A method for manufacturing a plurality of protrusions on an electrostatic chuck, comprising:

at S0, completely covering an electrode with a dielectric layer, with an upper surface of the dielectric layer being used as a support surface of the electrostatic chuck configured to carry a workpiece;

at S1, forming a patterned mask over the support surface;

at S2, generating a carbon plasma using a graphite target and depositing a hydrogen-free amorphous carbon layer over the support surface of both an area that is covered by the mask and an area that is not covered by the mask, with a process temperature of deposition not higher than 80°C; and

at S3, removing the mask to form the plurality of protrusions made of hydrogen-free amorphous carbon with a resistivity ranging from $10^{-4}\Omega\cdot\text{cm}$ ~ $10^9\Omega\cdot\text{cm}$ distributed at intervals on the support surface, so as to avoid hydrogen dissociation and falling off of the plurality of protrusions; wherein

S2 further comprises: generating the carbon plasma using the graphite target in a first region of a chamber through an electrical arc; filtering macroparticles and atomic groups out from the carbon plasma through a filter magnetic field provided in a second region of the chamber; and allowing the plasma after filtering to reach the mask and a base of the electrostatic chuck.

2. The method of claim 1, after S1 and before S2, further comprising:

at S12, depositing an adhesive layer over the support surface of both the area that is covered by the mask and the area that is not covered by the mask;

at S2, generating the carbon plasma using the graphite target and depositing the hydrogen-free amorphous carbon layer over the adhesive layer; and

at S3, removing the mask to form a plurality of adhesive parts composing the adhesive layer distributed at intervals on the support surface and the plurality of protrusions provided at a corresponding one of the plurality of adhesive parts.

3. The method of claim 2, wherein a material of the adhesive layer includes a metal, such as titanium or chromium.

4. The method of claim 1, wherein S2 further includes:

S21, generating the carbon plasma using the graphite target; and

S22, when the carbon plasma moves toward the support surface, and the hydrogen-free amorphous carbon layer is deposited over the support surface that is covered by the mask and not covered by the mask, using a magnetic field to filter and/or focus the carbon plasma.

5. The method of claim 1, wherein a height of a protrusion ranges from $1\mu\text{m}$ ~ $3\mu\text{m}$.

6. An electrostatic chuck manufactured with the method of any one of claims 1 to 5, comprising a support surface configured to carry a workpiece, and a plurality of protrusions distributed at intervals on the support surface, wherein the plurality of protrusions are formed by hydrogen-free amorphous carbon with a resistivity ranging from $10^{-4}\Omega\cdot\text{cm}$ ~ $10^9\Omega\cdot\text{cm}$.

7. The electrostatic chuck of claim 6, wherein a height of a protrusion ranges from $1\mu\text{m}$ ~ $3\mu\text{m}$.

8. The electrostatic chuck of claim 6, further comprising at least an adhesive layer, each adhesive layer comprising a plurality of adhesive parts having a same number as the plurality of protrusions, and each of the plurality of adhesive parts being provided between the support surface and a corresponding one of the plurality of protrusions.

9. The electrostatic chuck of claim 8, wherein a material of the adhesive layer comprises a metal having an adhesive property.

10. The electrostatic chuck of claim 9, wherein the metal comprises titanium or chromium.

11. The electrostatic chuck of any one of claims 6 to 10, further comprising a dielectric layer, and an electrode placed in the dielectric layer, wherein an upper surface of the dielectric layer is used as the support surface.