

CLAIMS

What is claimed is:

1. A plasma enhanced chemical vapor deposition processing method comprising:
preheating a showerhead to a preheated state prior to and in preparation of a
5 plasma enhanced chemical vapor deposition process of a substrate;
determining at least one temperature of the showerhead while preheating the
showerhead;
determining based on the at least one temperature whether to continue
preheating the showerhead;
10 ceasing to preheat the showerhead in response to the at least one temperature
satisfying a temperature criterion; and
initiating the plasma enhanced chemical vapor deposition process while the
showerhead is in the preheated state to package previously fabricated integrated
circuits disposed on the substrate, wherein the plasma enhanced chemical vapor
15 deposition process includes forming one or more film protective layers over the
integrated circuits.
2. The plasma enhanced chemical vapor deposition processing method of claim 1,
further comprising limiting the plasma enhanced chemical vapor deposition process to
temperatures less than or equal to 200°C.
- 20 3. The plasma enhanced chemical vapor deposition processing method of claim 1,
further comprising limiting temperatures of the showerhead to be between 50-200°C
while preheating the showerhead prior to performing the plasma enhanced chemical
vapor deposition process.
4. The plasma enhanced chemical vapor deposition processing method of claim 1
25 further comprising evacuating a processing chamber subsequent to preheating the
showerhead and prior to initiating the plasma enhanced chemical vapor deposition
process,
wherein the showerhead is disposed within the processing chamber.

5. The plasma enhanced chemical vapor deposition processing method of claim 1, wherein the preheating of the showerhead includes:
- supplying a reactant gas to a processing chamber; and
 - supplying radio frequency power to at least one of a first electrode disposed in a
- 5 substrate support or a second electrode disposed in the showerhead to generate plasma, wherein the showerhead is disposed in the processing chamber.
6. The plasma enhanced chemical vapor deposition processing method of claim 1, wherein the preheating of the showerhead includes supplying electrical current to at least one heating element in the showerhead.
- 10 7. The plasma enhanced chemical vapor deposition processing method of claim 1, wherein the preheating of the showerhead includes heating a fluid supplied to the showerhead.
8. The plasma enhanced chemical vapor deposition processing method of claim 1, further comprising:
- 15 preheating the showerhead prior to performing a series of multiple plasma enhanced chemical vapor deposition processes; and
- either
 - refraining from preheating the showerhead while and between
 - consecutive ones of the plasma enhanced chemical vapor deposition processes, or
- 20 preheating the showerhead between two of the plasma enhanced chemical vapor deposition processes.
9. The plasma enhanced chemical vapor deposition processing method of claim 1, wherein:
- the substrate is disposed on a substrate support;
 - 25 the substrate support comprises a first electrode;
 - the showerhead comprises a second electrode; and
 - the plasma enhanced chemical vapor deposition process includes providing
 - radio frequency power to at least one of the first electrode and the second electrode.

10. The plasma enhanced chemical vapor deposition processing method of claim 1, further comprising:
 ceasing preheating of the showerhead based on the at least one temperature;
 and
5 evacuating the processing chamber subsequent to ceasing the preheating of the showerhead and prior to the plasma enhanced chemical vapor deposition process.
11. The plasma enhanced chemical vapor deposition processing method of claim 1, further comprising:
 continuing preheating the showerhead in response to the at least one
10 temperature being less than or equal to a predetermined temperature; and
 ceasing preheating the showerhead in response to the at least one temperature being greater than the predetermined temperature.
12. The plasma enhanced chemical vapor deposition processing method of claim 1, further comprising:
15 preheating the showerhead prior to performing a series of multiple plasma enhanced chemical vapor deposition processes; and
 refraining from preheating the showerhead while and between consecutive ones of the plasma enhanced chemical vapor deposition processes.
13. The plasma enhanced chemical vapor deposition processing method of claim 1,
20 further comprising:
 performing a series of plasma enhanced chemical vapor deposition processes;
 and
 preheating the showerhead prior to performing each of the plasma enhanced
 chemical vapor deposition processes and between consecutive ones of the plasma
25 enhanced chemical vapor deposition processes.
14. The plasma enhanced chemical vapor deposition processing method of claim 1, further comprising performing another plasma enhanced chemical deposition process to fabricate the integrated circuits prior to the preheating of the showerhead, wherein:
 the another plasma enhanced chemical deposition process includes heating the
30 showerhead to a temperature between 150-350°C; and

the preheating of the showerhead the performing of the plasma enhanced chemical deposition process subsequent to the preheating of the showerhead includes limiting the temperature of the showerhead to less than or equal to 200°C.

15. The plasma enhanced chemical vapor deposition processing method of claim 1,
5 further comprising performing another plasma enhanced chemical deposition process to fabricate the integrated circuits prior to the preheating of the showerhead, wherein:

the another plasma enhanced chemical deposition process includes heating the showerhead to a temperature greater than 200°C; and

- 10 the preheating of the showerhead the performing of the plasma enhanced chemical deposition process subsequent to the preheating of the showerhead includes limiting the temperature of the showerhead to less than or equal to 200°C.