CLAIMS

1. A plasma enhanced chemical vapor deposition processing method for packaging previously fabricated integrated circuits, the method comprising:

preheating a showerhead to a preheated state prior to and in preparation of a plasma enhanced chemical vapor deposition process of a substrate, wherein the preheating of the showerhead is implemented via plasma heating or one or more heating elements in the showerhead;

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;

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 the previously fabricated integrated circuits disposed on the substrate, wherein the plasma enhanced chemical vapor deposition process includes forming one or more film protective layers over the previously fabricated integrated circuits to package the previously fabricated integrated circuits.

2. The plasma enhanced chemical vapor deposition processing method of claim 1, further comprising limiting the plasma enhanced chemical vapor deposition processing method for packaging the previously fabricated integrated circuits disposed on the substrate to temperatures less than or equal to 200˚C.

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 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 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.

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:

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

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;

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

evacuating a 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 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:

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, 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 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 showerhead to a temperature between 150-350˚C to form one or more layers of the integrated circuits;

the preheating of the showerhead for performing the plasma enhanced chemical deposition process to package the integrated circuits disposed on the substrate is performed subsequent to the another plasma enhanced chemical deposition process and includes limiting the temperature of the showerhead to less than or equal to 200˚C; and

the fabricating of the integrated circuits by performing the another plasma enhanced chemical deposition process provides the previously fabricated integrated circuits upon which the plasma enhanced chemical deposition process recited in claim 1 is performed.

15. 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 showerhead to a temperature greater than 200˚C to form one or more layers of the integrated circuits;

the preheating of the showerhead for performing the plasma enhanced chemical deposition process to package the integrated circuits disposed on the substrate is performed subsequent to the another plasma enhanced chemical deposition process and includes limiting the temperature of the showerhead to less than or equal to 200˚C; and

the fabricating of the integrated circuits by performing the another plasma enhanced chemical deposition process provides the previously fabricated integrated circuits upon which the plasma enhanced chemical deposition process recited in claim 1 is performed.

16. The plasma enhanced chemical vapor deposition processing method of claim 5, wherein the plasma is generated to preheat the showerhead and satisfy the temperature criterion.

17. The plasma enhanced chemical vapor deposition processing method of claim 6, wherein the electrical current is supplied to at least one electrical heating element in the showerhead to preheat the showerhead and satisfy the temperature criterion.

18. The plasma enhanced chemical vapor deposition processing method of claim 1, wherein the preheating of the showerhead is implemented via plasma heating.

19. The plasma enhanced chemical vapor deposition processing method of claim 1, wherein the one or more heating elements are electrodes receiving electrical current.