What is claimed is:

1. A method of forming a film, the method comprising:

flowing a process gas into a high density plasma chemical vapor deposition (HDP-CVD) chamber, the chamber housing a substrate having at least one feature, the process gas comprising a hydrocarbon reactant having a hydrogen to carbon (H:C) ratio that is less than or equal to 2:1 and one or more of hydrogen (H_2), helium (He), and argon (Ar), the substrate processed at a temperature in a range of from 400 °C to 650 °C and a pressure of less than 50 mTorr;

generating a plasma having a density greater than 10^{17} ions/m^3; and

depositing a carbon film in the at least one feature, the carbon film having a void in the at least one feature.

2. The method of claim 1, wherein the hydrocarbon reactant comprises one or more of an alkene and an alkyne.

3. The method of claim 2, wherein the hydrocarbon reactant is selected from the group consisting of acetylene (C_2H_2), propylene (C_3H_6), ethylene (C_2H_4), and methylacetylene (C_3H_4).

4. The method of claim 1, wherein the carbon film comprises an amorphous carbon (a-C) film.

5. The method of claim 1, wherein the at least one feature is selected from one or more of a trench, a via, a word-line slit, and a memory hole.

6. The method of claim 5, wherein the at least one feature has an aspect ratio greater than or equal to 50:1.

7. The method of claim 5, wherein the at least one feature extends a feature depth from a top surface of the substrate to a bottom surface and has a width defined by

a first sidewall and a second sidewall, and wherein the carbon film is deposited on the top surface, the first sidewall, the second sidewall, and the bottom surface and the void is located within the width of the at least one feature at a first distance from the bottom surface of the feature.

8. A method of forming a film, the method comprising:

flowing a process gas into a high density plasma chemical vapor deposition (HDP-CVD) chamber, the chamber housing a substrate having a substrate surface, the process gas comprising a hydrocarbon reactant having a hydrogen to carbon (H:C) ratio that is less than or equal to 2:1 and one or more of hydrogen (H_2), helium (He), and argon (Ar), the substrate is processed at a temperature in a range of from 400 °C to 650 °C and a pressure of less than 50 mTorr;

generating a plasma having a density greater than 10^{17} ions/m^3; and

depositing a carbon film on the substrate surface, the substrate surface having at least one feature thereon, the at least one feature extending a depth from the substrate surface to a bottom surface, the at least one feature having a width defined by a first sidewall and a second sidewall, wherein the carbon film is deposited on the substrate surface, the first sidewall, the second sidewall, and the bottom surface of the at least one feature, the carbon film having a void located within the width of the feature at a first distance from the bottom surface of the feature.

9. The method of claim 8, further comprising etching or planarizing the carbon film such that the carbon film is substantially coplanar with the substrate surface, and depositing a second film on the substrate surface and on a top surface of the carbon film, the second film comprises one or more of silicon nitride (SiN) or silicon oxide (SiO_x).

10. The method of claim 8, wherein the hydrocarbon reactant is selected from the group consisting of acetylene (C_2H_2), propylene (C_3H_6), ethylene (C_2H_4), and

methylacetylene (C_3H_4).

11. The method of claim 8, wherein the carbon film comprises an amorphous carbon (a-C) film.

12. The method of claim 9, further comprising annealing the substrate, wherein the second film reduces shrinkage of carbon film during anneal.

13. The method of claim 8, wherein the feature has an aspect ratio greater than or equal to 10:1.

14. The method of claim 8, wherein the depth of the at least one feature is in a range of 50 nm to 10000 nm.

15. A method of manufacturing a memory device, the method comprising:

forming a film stack on a substrate, the film stack comprising a plurality of alternating layers of first material and a second material and the film stack having a stack thickness;

etching the film stack to form a memory hole opening extending a depth from a top surface of the film stack to a bottom surface, the memory hole opening having a width defined by a first sidewall and a second sidewall;

loading the substrate into a high density plasma chemical vapor deposition (HDP-CVD) chamber;

flowing a process gas into the high density plasma chemical vapor deposition (HDP-CVD) chamber, the process gas comprising a hydrocarbon reactant having a hydrogen to carbon (H:C) ratio that is less than or equal to 2:1 and one or more of hydrogen (H_2), helium (He), and argon (Ar), the film stack at a temperature in a range of from 400 °C to 650 °C and at a pressure of less than 50 mTorr, and at a plasma density greater than 10^{17} ions/m^3; and

depositing a carbon film on the top surface of the film stack, and on the first sidewall, the second sidewall, and the bottom surface of the memory hole opening,

the carbon film having a void located within the width of the memory hole opening at a first distance from the bottom surface of the memory hole opening.

16. The method of claim 15, further comprising etching or planarizing the carbon film such that the carbon film is substantially coplanar with the substrate surface, and depositing a second film on the substrate surface and on a top surface of the carbon film.

17. The method of claim 15, wherein the hydrocarbon reactant is selected from the group consisting of acetylene (C_2H_2), propylene (C_3H_6), ethylene (C_2H_4), and methylacetylene (C_3H_4).

18. The method of claim 16, wherein the second film comprises one or more of silicon nitride (SiN) or silicon oxide (SiO_x).

19. The method of claim 15, wherein the first material and the second material independently comprise one or more of an oxide material, a nitride material, and a polysilicon material.