What is claimed is:

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

exposing a substrate to an aromatic precursor in a processing chamber;

purging the processing chamber of the aromatic precursor;

heating the substrate to a temperature less than 600℃ to polymerize the aromatic precursor and deposit a graphene hard mask film on the substrate; and

purging the processing chamber.

2. The method of claim 1, wherein the aromatic precursor comprises one or more of benzene, substituted benzene, naphthalene, substituted naphthalene, anthracene, and substituted anthracene.

3. The method of claim 1, wherein the aromatic precursor comprises small aromatic molecules with temperature sensitive functional groups.

4. The method of claim 1, wherein the aromatic precursor is selected from one or more of naphthalene, 2,6-dibromonaphthalene, trimethyl 1,3,5-benzentricarboxylate, 9,10-dibromoanthracene, benzoic acid, 2,6-ditertbutylnaphthalene, 1,3,5-trimethoxybenzene, and hexabromobenzene.

5. The method of claim 1, wherein the substrate comprises on or more of titanium nitride (TiN), tantalum nitride (TaN), silicon (Si), cobalt (Co), titanium (Ti), silicon dioxide (SiO_2), copper (Cu), and low-k dielectric materials.

6. The method of claim 1, wherein the substrate is maintained at a temperature in a range of from 150 °C to 600 °C.

7. The method of claim 6, wherein the substrate is maintained at a temperature in a range of from 300℃ to 500℃.

8. The method of claim 1, further comprising repeating the method to provide a graphene hard mask film having a thickness of 0.3 to 100 nm.

9. The method of claim 1, further comprising exposing the substrate to a reactant.

10. The method of claim 9, wherein the substrate is exposed to the aromatic precursor and the reactant simultaneously.

11. The method of claim 9, wherein the substrate is exposed to the aromatic precursor and the reactant sequentially.

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

forming a graphene hard mask film on a substrate by exposing the substrate to an aromatic precursor at a temperature less than 600℃ to polymerize the aromatic precursor in a processing chamber;

purging the processing chamber; and

exposing the substrate to a plasma.

13. The method of claim 12, wherein the aromatic precursor comprises one or more of benzene, substituted benzene, naphthalene, substituted naphthalene, anthracene, and substituted anthracene.

14. The method of claim 12, wherein the aromatic precursor is selected from one or more of naphthalene, 2,6-dibromonaphthalene, trimethyl 1,3,5-benzentricarboxylate, 9,10-dibromoanthracene, benzoic acid, 2,6-ditertbutylnaphthalene, 1,3,5-trimethoxybenzene, and hexabromobenzene.

15. The method of claim 12, wherein the substrate comprises on or more of titanium nitride (TiN), tantalum nitride (TaN), silicon (Si), cobalt (Co), titanium (Ti), silicon dioxide (SiO_2), copper (Cu), and low-k dielectric materials.

16. The method of claim 12, wherein the plasma is a remote plasma.

17. The method of claim 12, wherein the plasma comprises one or more of ammonia (NH_3), nitrogen (N_2), argon (Ar), helium (He), hydrogen (H_2), carbon monoxide (CO), or carbon dioxide (CO_2).

18. A non-transitory computer readable medium including instructions, that, when executed by a controller of a processing chamber, causes the processing chamber to perform operations of:

expose a substrate to an aromatic precursor in the processing chamber;

purge the processing chamber of the aromatic precursor;

heat the substrate to a temperature less than 600℃ to polymerize the aromatic precursor and deposit a graphene hard mask film on the substrate; and

purge the processing chamber.

19. The non-transitory computer readable medium of claim 18, wherein the aromatic precursor comprises one or more of benzene, substituted benzene, naphthalene, substituted naphthalene, anthracene, and substituted anthracene.

20. The non-transitory computer readable medium of claim 18, wherein the substrate comprises on or more of titanium nitride (TiN), tantalum nitride (TaN), silicon (Si), cobalt (Co), titanium (Ti), silicon dioxide (SiO_2), copper (Cu), and low-k dielectric materials.