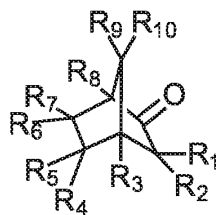


What is claimed is:

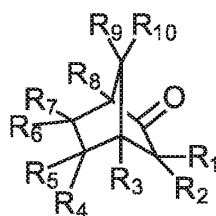
1. A method comprising forming an amorphous carbon film on a substrate by exposing the substrate to a carbon precursor having a structure of formula (I)



(I)

- 5 wherein each of R_1 - R_{10} are independently selected from H, a halogen, or a substituted or unsubstituted C_1 - C_4 alkyl.
2. The method of claim 1, wherein the carbon precursor comprises one or more of camphor, L-fenchone, 3-chloro-2-norbornanone, norbornanone, 1,3,7,7-tetramethyl-2-norbornanone, norcamphor, (1*R*)-(-)-fenchone, (+)-fenchone, (-)-fenchone.
- 10 3. The method of claim 1, wherein the substrate is maintained at a temperature range of about 100 °C to about 650 °C, and wherein forming the amorphous carbon film occurs at a pressure in a range of about 1 Torr to about 600 Torr.
- 15 4. The method of claim 1, wherein the carbon precursor is heated in an ampoule and flowed to the substrate with a carrier gas comprising one or more of hydrogen (H_2), argon (Ar), helium (He), xenon (Xe), or nitrogen (N_2).
- 20 5. The method of claim 1, wherein the amorphous carbon film is formed by a thermal decomposition process.

6. The method of claim 1, wherein the amorphous carbon film is one or more of conformal or ashable.
7. The method of claim 1, wherein the amorphous carbon film is a hard mask layer, and wherein the substrate comprises a layer to be patterned.
8. The method of claim 1, wherein the substrate comprises one or more of an adhesion layer or a dielectric layer.
9. The method of claim 1, wherein the substrate comprises at least one feature selected from a peak, a trench, or a via, and wherein the amorphous carbon film is conformal.
10. A method of etching a substrate comprising:
 - forming an amorphous carbon hard mask on the substrate, the amorphous carbon hard mask having at least one opening and formed by exposing the substrate to a carbon precursor having a structure of formula (I)

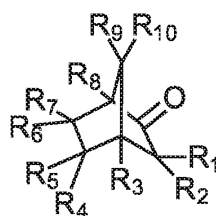


(I)

- wherein each of R_1 - R_{10} are independently selected from H, a halogen or a substituted or unsubstituted C_1 - C_4 alkyl; and etching the substrate through the at least one opening.

11. The method of claim 10, wherein the carbon precursor comprises one or more of camphor, L-fenchone, 3-chloro-2-norbornanone, norbornanone, 1,3,7,7-tetramethyl-2-norbornanone, norcamphor, (1*R*)-(-)-fenchone, (+)-fenchone, (-)- or fenchone.

12. The method of claim 10, further comprising forming a photoresist prior to etching, the photoresist formed between the substrate and the amorphous carbon hard mask or on the amorphous carbon hard mask.
- 5 13. The method of claim 10, further comprising removing the amorphous carbon hard mask after etching the substrate.
14. The method of claim 10, wherein the amorphous carbon hard mask is formed at a temperature less than about 600 °C and a pressure in a range of about 1
10 Torr to about 600 Torr.
15. A method comprising:
providing a substrate having a substrate surface;
exposing the substrate to a carbon precursor at a temperature in a range
15 of about 100 °C to about 650 °C and a pressure in a range of about 1 Torr to about 600 Torr to form a carbon hard mask on the substrate surface, the carbon precursor having a structure of formula (I)



(I)

- wherein each of R_1 - R_{10} are independently selected from H, a halogen or a
20 substituted or unsubstituted C_1 - C_4 alkyl;
etching at least a portion of the substrate through an opening in the
carbon hard mask; and
removing the carbon hard mask from the substrate surface by ashing.