CLAIMS

1. A method of processing a substrate, comprising:

depositing one or more amorphous carbon hardmask layers onto the substrate;

conducting a rapid thermal anneal operation on the substrate after depositing the one or more amorphous carbon hardmask layers, the rapid thermal anneal operation lasting for an anneal time that is less than 30 seconds, and the rapid thermal anneal operation comprising:

heating the substrate to an anneal temperature that is within a range of 600 degrees Celsius to 1,000 degrees Celsius; and

etching the substrate after conducting the rapid thermal anneal operation.

2. The method of claim 1, wherein the etching the substrate comprises conducting an etching operation on the substrate at an etch temperature that is 0 degrees Celsius or less.

3. The method of claim 1, wherein the one or more amorphous carbon hardmask layers have an sp^2 matrix or an sp^3 matrix.

4. The method of claim 1, wherein the anneal time is within a range of 8 seconds to 12 seconds, the anneal temperature is within a range of 880 degrees Celsius to 920 degrees Celsius, and the rapid thermal anneal operation is conducted at an anneal pressure that is within a range of 250 mTorr to 760 Torr.

5. The method of claim 4, wherein the rapid thermal anneal operation further comprises exposing the substrate to an anneal gas composition, the anneal gas composition comprising one or more of argon, nitrogen, helium, or hydrogen.

6. The method of claim 5, wherein the one or more amorphous carbon hardmask layers are deposited onto the substrate at a deposition temperature that is within a range of 300 degrees Celsius to 750 degrees Celsius and at a deposition pressure that is 12 Torr or less.

7. The method of claim 6, further comprising patterning the substrate after the rapid thermal anneal operation is conducted.

8. The method of claim 1, wherein the one or more amorphous carbon hardmask layers comprise a hardmask thickness that is 7 microns or less.

9. The method of claim 1, wherein the rapid thermal anneal operation alters a film stress of the one or more amorphous carbon hardmask layers to be 100 MPa or less.

10. The method of claim 1, wherein the rapid thermal anneal operation alters a film stress of the one or more amorphous carbon hardmask layers to be tensile.

11. A non-transitory computer readable medium for processing a substrate comprising instructions that, when executed, cause a plurality of operations to be conducted, the plurality of operations comprising:

depositing one or more amorphous carbon hardmask layers onto the substrate;

conducting a rapid thermal anneal operation on the substrate after depositing the one or more amorphous carbon hardmask layers, the rapid thermal anneal operation lasting for an anneal time that is less than 30 seconds, and the rapid thermal anneal operation comprising:

heating the substrate to an anneal temperature that is within a range of 600 degrees Celsius to 1,000 degrees Celsius; and

etching the substrate after conducting the rapid thermal anneal operation.

12. The non-transitory computer readable medium of claim 11, wherein the etching the substrate comprises conducting an etching operation on the substrate at an etch temperature that is 0 degrees Celsius or less.

13. The non-transitory computer readable medium of claim 11, wherein the one or more amorphous carbon hardmask layers have an sp^2 matrix or an sp^3 matrix.

14. The non-transitory computer readable medium of claim 11, wherein the anneal time is within a range of 8 seconds to 12 seconds, and the anneal temperature is within a range of 880 degrees Celsius to 920 degrees Celsius.

15. The non-transitory computer readable medium of claim 14, wherein the rapid thermal anneal operation further comprises exposing the substrate to an anneal gas composition, the anneal gas composition comprising one or more of argon, nitrogen, helium, or hydrogen.

16. The non-transitory computer readable medium of claim 15, wherein the one or more amorphous carbon hardmask layers are deposited onto the substrate at a deposition temperature that is within a range of 300 degrees Celsius to 750 degrees Celsius and at a deposition pressure that is 12 Torr or less.

17. The non-transitory computer readable medium of claim 16, wherein the plurality of operations further comprise patterning the substrate after the rapid thermal anneal operation.

18. The non-transitory computer readable medium of claim 11, wherein the rapid thermal anneal operation alters a film stress of the one or more amorphous carbon hardmask layers to be 100 MPa or less.

19. A system for processing a substrate, comprising:

a deposition chamber;

an anneal chamber;

a transfer chamber coupled to the deposition chamber and the anneal chamber;

a cryogenic etch chamber;

a controller comprising instructions that, when executed, cause:

the deposition chamber to deposit one or more amorphous carbon hardmask layers onto the substrate,

the anneal chamber to conduct a rapid thermal anneal operation on the substrate after the depositing the one or more amorphous carbon hardmask layers onto the substrate, the rapid thermal anneal operation lasting for an anneal time that is less than 30 seconds, and the rapid thermal anneal operation comprising:

heating the substrate to an anneal temperature that is within a range of 600 degrees Celsius to 1,000 degrees Celsius; and

the cryogenic etch chamber to etch the substrate after the rapid thermal anneal operation is conducted.

20. The system of claim 19, wherein the deposition chamber, the anneal chamber, and the transfer chamber are mounted to a frame of a cluster tool.