

What is claimed is:

1. A method of forming a hardmask, comprising:
 - performing a first plasma-enhanced surface treatment in a process chamber;
 - subsequent to performing the first plasma-enhanced surface treatment, depositing a season material on a plurality of exposed surfaces of the process chamber;
 - subsequent to depositing the season material on the plurality of exposed surfaces of the process chamber, positioning a substrate in the process chamber and in contact with the season material;
 - performing a treatment on the substrate, the treatment comprising at least one of:
 - performing a second plasma-enhanced surface treatment;
 - forming a barrier layer on the substrate; and
 - performing a low frequency RF treatment; and
 - forming, subsequent to performing the at least one treatment, a metal hardmask film on the substrate-

~~2. The method of claim 1, wherein the season material comprises at least two of silicon oxide, silicon nitride, amorphous silicon or combinations thereof, wherein the season material comprises a hardness that is less than half of a hardness of the substrate.~~

~~3. The method of claim 1, wherein the first plasma-enhanced surface treatment includes introducing a gas into the process chamber through a blocker plate comprising apertures with unequal spacing therebetween.~~

~~4. The method of claim 1,~~

wherein forming the barrier layer comprises at least one cycle of soaking the substrate in a precursor for a first period of time to form a target barrier layer thickness and, subsequently, performing a plasma-enhanced treatment for a second period of time;

5. ~~The method of claim 4, wherein the target barrier layer thickness is from about 3 angstroms to about 50 angstroms.~~

6. ~~The method of claim 4, wherein, during the second period of time, a plurality of gases employed in the plasma-enhanced treatment is ramped up to a target gas flow rate over a predetermined period of gas flow time and .~~

7. ~~The method of claim 6, wherein the predetermined period of gas flow time is from about 5 seconds to about 30 seconds.~~

8. ~~A method of substrate fabrication, comprising:
— cleaning a process chamber;
subsequently, performing a first plasma-enhanced surface treatment in a process chamber;
— subsequent to performing the first plasma-enhanced surface treatment, depositing a season material on a plurality of exposed surfaces of the process chamber, the season material comprising at least two of silicon oxide, silicon nitride, amorphous silicon or combinations thereof or combinations thereof;
positioning a substrate in the process chamber in contact with the season material; and
forming a metal hardmask film on the substrate.~~

9. ~~The method of claim 8, wherein the metal hardmask film comprises at least one of tungsten (W), cobalt (Co), titanium (Ti), molybdenum (Mo), yttrium~~

(Y), zirconium (Zr), or alloys or combinations thereof, and a dopant comprising at least one of boron, carbon, nitrogen, or silicon.

10. — The method of claim 8, further comprising: subsequent to positioning the substrate in the process chamber, and prior to forming the metal hardmask film, performing a treatment on the substrate comprising at least one of: —

— performing a second plasma-enhanced surface treatment;

— forming a barrier layer on the substrate; and

— performing a low frequency RF treatment.

11. — The method of claim 10, wherein the metal hardmask film includes a first metal comprising tungsten (W), cobalt (Co), titanium (Ti), molybdenum (Mo), yttrium (Y), or zirconium (Zr), and the barrier layer includes the first metal.

12. — The method of claim 10, further comprising:

— during the forming of the barrier layer, introducing a plurality of process gases to the process chamber; and

— performing gas ramping during the forming of the barrier layer, wherein, during the gas ramping, a target gas flow of the plurality of process gases is achieved in the process chamber in a time period from 5 second to 30 seconds after introducing the plurality of process gases to the process chamber.

13. — A device comprising:

— a silicon substrate;

— a stack including plurality of alternating silicon nitride and silicon oxide layers formed on the silicon substrate;

— a barrier layer formed on the stack; and

— a hardmask film formed on the barrier layer.

14. — ~~The device of claim 13, wherein the hardmask film comprises a first metal comprising tungsten (W), cobalt (Co), titanium (Ti), molybdenum (Mo), yttrium (Y), zirconium (Zr), or alloys or combinations thereof, and a dopant comprising at least one of boron, carbon, nitrogen, or silicon.~~

15. — ~~The device of claim 14, wherein the barrier layer has a thickness within a range of about 5 angstroms to about 30 angstroms.~~