Claims

1. A physical vapor deposition (PVD) chamber comprising:

a plurality of cathode assemblies including a first cathode assembly including a first backing plate to support a first target during a sputtering process and a second cathode assembly including a second backing plate configured to support a second target during a sputtering process;

an upper shield below the plurality of cathode assemblies having a first shield hole having a diameter and positioned on the upper shield to expose the first cathode assembly and a second shield hole having a diameter and positioned on the upper shield to expose the second cathode assembly, the upper shield having a flat inside surface, except for a region between the first shield hole and the second shield hole; and

a raised area in the region between the first shield hole and the second shield hole, the raised area having a height greater than one centimeter from the flat inside surface and having a length greater than the diameter of the first shield hole and the diameter of the second shield hole, wherein the PVD chamber is configured to alternately sputter material from the first target and the second target without rotating the upper shield,

wherein the first cathode assembly comprises a first magnet spaced apart from the first backing plate at a first distance and the second cathode assembly comprises a second magnet spaced apart from the second backing plate at a second distance, wherein the first magnet and the second magnet are movable such that the first distance can be varied and the second distance can be varied, wherein the first target comprises a molybdenum target and the second target comprises a silicon target, the PVD chamber further comprising a third cathode assembly including a third backing plate to support a third target during a sputtering process and a fourth cathode assembly including a fourth backing plate configured to support a fourth target, and wherein the third target comprises a dummy target and the fourth target comprises a dummy target.

2. The PVD chamber of claim 1, wherein the raised area has a height sufficient so that during a

sputtering process, the raised area prevents material sputtered from the first target from being deposited on the second target and to prevent material sputtered from the second target from being deposited on the first target.

~~3. The PVD chamber of claim 1, wherein the first cathode assembly comprises a first magnet spaced apart from the first backing plate at a first distance and the second cathode assembly comprises a second magnet spaced apart from the second backing plate at a second distance, wherein the first magnet and the second magnet are movable such that the first distance can be varied and the second distance can be varied.~~

~~4~~3. The PVD chamber of claim ~~3~~1, wherein the first magnet and second magnet are configured to be moved to decrease the first distance and the second distance to increase magnetic field strength produced by the first magnet and the second magnet and to increase the first distance and the second distance to decrease magnetic field strength produced by the first magnet and the second magnet.

~~5. The PVD chamber of claim 3, wherein the first target comprises a molybdenum target and the second target comprises a silicon target, the PVD chamber further comprising a third cathode assembly including a third backing plate to support a third target during a sputtering process and a fourth cathode assembly including a fourth backing plate configured to support a fourth target.~~

~~6. The PVD chamber of claim 5, where the third target comprises a dummy target and the fourth target comprises a dummy target.~~

~~7~~4. The PVD chamber of claim ~~6~~1, wherein the third target and the fourth target are positioned with respect to the first target and second target so that when the upper shield is in a first position, the first target is exposed through the first shield hole and the second target is exposed through the second shield hole, and the third target and fourth target are covered by the upper shield, and when the upper shield is rotated to a second position, the fourth target is exposed through the second shield hole and the second target is exposed through the first shield hole.

~~8~~5. The PVD chamber of claim ~~7~~4, wherein when the upper shield is rotated to a third position, the first target is exposed through the second shield hole and the ~~fourth~~ third target is exposed through the first shield hole.

~~9~~6. A physical vapor deposition (PVD) chamber comprising:

a plurality cathode assemblies including a first cathode assembly including a first backing plate supporting a first target comprising molybdenum and a second cathode assembly including a second backing plate supporting a second target comprising silicon, a third cathode assembly including a third backing plate supporting a third target comprising a dummy material, and a fourth cathode assembly including a fourth backing plate supporting a fourth target comprising a dummy material;

an upper shield below the plurality of cathode assemblies having a first shield hole having a diameter and positioned on the upper shield to expose the first target and a second shield hole having a diameter and positioned on the upper shield to expose the second target, the upper shield having a flat surface, except for a region between the first shield hole and the second shield hole, the upper shield configured to permit molybdenum and silicon material to be alternately sputtered from the first target and the second target respectively without rotating the upper shield; and

a raised area in the region between the first shield hole and the second shield hole, the raised area having a height greater than one centimeter and having a length greater than the diameter of the first shield hole and the second shield hole, wherein the upper shield is rotatable to allow one of the first shield hole and the second shield hole to expose the first target and one of third target and the fourth target.

~~10~~7. The PVD chamber of claim ~~9~~6, wherein each of the first cathode assembly, the second cathode assembly, third cathode assembly and fourth cathode assembly comprise a magnet spaced apart from the first backing plate at a first distance, the second backing plate at a second distance, the third backing plate at a third distance and the fourth backing plate at a fourth distance, each of the magnets being movable to increase or decrease each of the first distance, the second distance, third distance or fourth distance.

~~11~~8. The PVD chamber of claim ~~10~~7, wherein decreasing the first distance, the second distance, the third distance or the fourth distance increases magnetic field strength produced by the magnet, and increasing the first distance, the second distance, the third distance or the fourth distance decreases magnetic field strength produced by the magnet.

~~12~~9. The PVD chamber~~method~~ of claim ~~11~~8, further comprising cleaning second material deposited on the first target by applying a magnetic field to the first target that is greater than a magnetic field applied during depositing alternating material layers.

~~13~~10. PVD chamber ~~The method~~ according to claim ~~11~~8, further comprising rotating the upper shield from ~~the~~ a first position to a second position prior to cleaning the first material from the second target, the fourth target is exposed through the second shield hole and the second target is exposed through the first shield hole.

~~14~~11. The PVD chamber~~method~~ according to claim ~~13~~10, further comprising rotating the upper shield from the second position to a third position so that the first target is exposed through the second shield hole and the ~~fourth~~ third target is exposed through the first shield hole.

~~15~~12. The PVD chamber~~method~~ according to claim ~~14~~11, wherein ~~the~~ a substrate comprises an extreme ultraviolet (EUV) mask blank.