

What is claimed is:

1. A physical vapor deposition (PVD) system, comprising:
 - a vacuum processing chamber comprising:
 - a sputtering target;
 - a substrate support disposed within the vacuum processing chamber
 - configured to position a substrate proximate to the sputtering target;
 - a deposition shield disposed within the vacuum processing chamber;
 - a processing region disposed within the vacuum processing chamber and
 - bounded by a surface of the target, a surface of the substrate support, and an inner surface of the deposition shield; and
 - a coil portion of an electromagnet, wherein the coil portion is disposed within the vacuum processing chamber and outside the processing region.
2. The PVD system of claim 1, further comprising an annular structure on which the coil portion is disposed, wherein the annular structure is disposed within the vacuum processing chamber and outside of the processing region.
3. The PVD system of claim 2, wherein the annular structure includes a conduit for flowing of a cooling liquid within the annular structure.
4. The PVD system of claim 3, wherein the conduit includes multiple channels that are fluidly separated from each other by a divider.
5. The PVD system of claim 4, wherein the divider is configured to support a water cover that fluidly separates the coil from the conduit.
6. The PVD system of claim 2, wherein the coil is disposed in a cavity formed in the annular structure.
7. The PVD system of claim 6, further comprising a cover plate that fluidly separates the coil from vacuum when vacuum is present in the vacuum processing chamber.

8. The PVD system of claim 6, wherein the cavity is fluidly coupled to atmosphere exteriorly of the vacuum processing chamber during processing of substrates within the vacuum processing chamber.
9. The PVD system of claim 1, further comprising a direct current (DC) power supply coupled to the coil portion.
10. The PVD system of claim 9, wherein the DC power supply comprises one of a programmable power supply configured to generate a variable DC output in response to a command selecting an output profile or a controllable power supply configured to generate a variable DC output in response to an input value.
11. The PVD system of claim 1, further comprising an additional coil portion of an additional electromagnet, wherein the additional coil portion is disposed within the vacuum processing chamber and outside the processing region.
12. The PVD system of claim 11, wherein coil portion is coupled to a first DC power supply and the additional coil portion is coupled to a second DC power supply.
13. A method of physical vapor deposition in a vacuum chamber, the method comprising:
- positioning a substrate in a processing region of the vacuum chamber, wherein the processing region is disposed between a surface of a sputtering target of the vacuum chamber, a surface of a substrate support in the vacuum chamber, and an inner surface of a deposition shield disposed in the vacuum chamber;
 - generating a plasma in a processing region; and
 - when the plasma is present in the processing region, applying direct current (DC) power to a coil portion of an electromagnet, wherein the coil portion is disposed within the vacuum chamber and outside the processing region.

14. The method of claim 13, wherein the coil portion is disposed on an annular structure, the method further comprising, when the plasma is present in the processing region, supplying a cooling liquid to a conduit disposed within the annular structure.

15. The method of claim 13, wherein applying the DC power to the coil portion comprises applying pulsed DC power to the coil portion from a variable output DC power source.