Claims

1. Cathodic arc evaporation apparatus comprising:
   - a planar target (3) as cathode having
     - o a front-target surface (3’), comprising an active target surface (3’’) where magnetic field lines enter the target surface in an acute angle $\alpha \leq 45°$,
     - o a back-target surface, parallel to the front-target surface but facing a target back plate (12) placed in the opposite side in relation to the front-target surface, and
     - o a side-target surface connecting the front-target surface with the back-target surface,
   - an electrically floating confinement (4) located adjacent, preferably surrounding or at least partially surrounding the side-target surface, the confinement comprising an inner surface and an outer surface, wherein the side-target surface is closer to the inner surface of the confinement than to the outer surface of the confinement,
   - an electrode as anode (2) having an inner surface (2’, 2’’, 2’’’) for acting as electron receiving surface,
   - a magnetic guidance system adapted to provide magnetic fields comprising magnetic field lines (8, 8’,9) located in front of the front-target surface,

   whereat

   - the inner surface of the confinement (4) is placed:

- between the front-target surface and the electron receiving surface (2', 2'', 2''') of the anode (2), if the distance in a perpendicular plane in relation to the front-target surface is considered, and/or
- between the side-target surface and the electron receiving surface of the anode, if the distance in a parallel plane in relation to the front-target surface is considered, and

- the magnetic guidance system is designed and adjusted for producing at least following two magnetic fields regions:
  - a first region comprising magnetic field lines (9) located in front of the front-target surface which exit the front-target surface (3') and end in the inner surface (4', 4'', 4''') of the confinement member (4), and
  - a second region comprising magnetic field lines (8, 8') located in front of the front-target surface which exit the front-target surface (3') and end in the electron receiving surface (2', 2'', 2''') of the anode (2),

whereat

- the magnetic guidance system comprises at least a central magnet (14) having a pole placed in front of a center of a back surface of the target and being axially aligned to it, and a peripheral ring magnet (15) having a reciprocal pole in or below a target plane, the ring magnet in prospect encompasses the

central magnet and at least a part of the target, and

- the magnetic guidance system further comprises a peripheral yoke (17) encompassing the ring-magnet, the target and the anode, the peripheral yoke being made of magnetizable material.

2. Apparatus according to claim 1, wherein the apparatus comprises a ferromagnetic central limiter (16) arranged in or round the center of the target surface (3', 3''), the central limiter (16) being electrically floating for modifying the trajectory of the magnetic fields lines that exit the front-target surface in order to make them essentially parallel to the plane of the front-target surface.

3. Cathodic arc evaporation apparatus comprising

- a planar target (3) which has a target surface (3') comprising an active target surface (3'') from where material can be evaporated in a cathodic arc process;
- a confinement (4) surrounding an outer border of the target surface (3');
  - an anode (2) having an inner electron receiving surface (2', 2'', 2'''), the anode (2) encompassing at least one of the target (3) and the confinement (4) in at least one of a target

plane and an axial distance in front of the active surface;

- a magnetic guidance system adapted to provide a magnetic field at the target surface being essentially in parallel to at least an outer region of the target surface so that magnetic field lines are in parallel to the target surface or inclined to it in an acute angle α, whereat an active surface (3'') is defined in a surface (3') area where magnetic field lines enter the target surface in an acute angle $\alpha \leq 45°$;
- the target being circular and having a central axis Z or a central plane Z';
- wherein the confinement (4) and the anode (2) both are made in closed geometry and both are electrically isolated against each other and the target, whereat the minimum distance of the electron receiving surface (2', 2'',2''') from the active surface (3'') is defined by at least one of a radial distance Δr_{14} of an outer border of the target surface (3') to an inner border of the electron receiving surface, whereby the outer border of the target surface (3') has a radial distance r1 from the central axis Z or central plane Z' of the target, and the inner border of the electron receiving surface has a radial distance r4 from the central axis Z or central plane Z' of the target, and an axial distance h1 from the target surface (3') to an upper border of the confinement or an axial distance h2 from the target surface (3') to a

lower border of the electron receiving surface (2', 2'', 2''');

whereat

- the magnetic guidance system comprises at least a central magnet (14) having a pole placed in front of a center of a back surface of the target and being axially aligned to it, and a peripheral ring magnet (15) having a reciprocal pole in or below a target plane, the ring magnet in prospect encompasses the central magnet and at least a part of the target, and
- the magnetic guidance system further comprises a peripheral yoke (17) encompassing the ring-magnet, the target and the anode, the peripheral yoke being made of magnetizable material.

4. Apparatus according to claim 2 to 3, wherein the essentially parallel magnetic field extends from the active target surface (3') at least to an axial distance (h1, h2) of the confinement or the electron receiving surface, and/or extends at least to a height of 5 to 20 mm above the target surface.

5. Apparatus according to one of the previous claims, wherein in a zone A above the active target surface, the strength of the magnetic flux density B_A can be set from 20 to 500 Gauss or even higher whereat zone A is sidewise delimited by a confinement on floating potential which encompasses the target and to the center of the target by

an inactive surface region of the target, where magnetic field lines enter the target surface in an angle > 45°, or by a central limiter, and zone A is delimited in an axial direction from the target by the last magnetic field line (9) which enters the confinement at its upper border.

6. Apparatus according to one of the previous claims, characterized in that at least one of the central magnet and the ring-magnet is an electromagnet or a permanent magnet.

7. Apparatus according to one of the previous claims, wherein a magnetic axis of the ring-magnet is tilt away from the central axis Z or plane Z' in an upwards direction.

8. Apparatus according to one of the previous claims, wherein the ring-magnet comprises two electromagnetic coils C2 and C3, whereby the diameter of C3 is larger than the diameter of C2.

9. Apparatus according to one of the previous claims, wherein the magnetic guidance system further comprises a central limiter arranged in or round the center of the target surface, the central limiter being electrically isolated against the target and made of magnetic material having a Curie-temperature T_C > 500°C.

10. Apparatus according to claim 9, wherein the central limiter protrudes 0 to 20 mm above the target surface or to an axial distance h1 or h2, or is in a plane with the target surface.

11. Apparatus according to one of the previous claims, wherein the confinement is made of non-magnetic material.

12. Vacuum chamber comprising a cathodic arc evaporation apparatus according to one of the forgoing claims 1 to 11.

13. Method to deposit a coating on a substrate in a vacuum chamber according to claim 12 by use of a cathodic arc evaporation apparatus according to one of claims 1 to 12, whereat a magnetic field is set which is essentialy in parallel at and near the active target surface at least for an outer region of the active target surface.

14. Method according to claim 13, wherein an electron trap is established at least immediately above a target surface within a zone A by applying an essentially parallel magnetic field, with magnetic field lines entering the target surface in an acute angle $\alpha \leq 45°$, to at least an outer region of the target surface (3) by use of the magnetic guidance system, whereby the active surface (3'') is formed, and a cathodic arc discharge is ignited and maintained on the active surface, whereat zone A is sidewise delimited by a confinement on floating potential which encompasses the target and to the center

of the target by an inactive surface region of the target, where magnetic field lines enter the target surface in an angle > 45°, or by a central limiter, and zone A is delimited in an axial direction from the target by the last magnetic field line (9) which enters the confinement at its upper border.

15. Method according to one of the claims 13 or 14, wherein a zone B is formed above zone A to about an axial distance h3, given by the maximum axial distance of the electron receiving surface from the target surface, or to the last field line (8) which enters the electron receiving surface at its highest or outermost border, whereat the average magnetic field strength of zone B will be lower than the average magnetic field strength in zone A.

16. Method according to one of the claims 13 to 145, wherein a zone C is formed between the arc source and a substrate (7) surface to be coated, thereby above zone A and B, wherein the magnetic field is very low or zero and the atmosphere comprises reactive gas molecules and at least one of positively ionized metallic ions, and positively ionized reacted metal ions.