Claims

1. Valve component comprising a substrate (1) with at least one sliding surface (10), the sliding surface (10) being designed to be subjected to sliding against another surface during operation of the valve, wherein at least a portion of the sliding surface (10) is coated with a coating (2) comprising an under-layer (21) comprising tungsten and an upper-layer (22) deposited atop the under-layer (21), said upper-layer (22) comprising diamond-like-carbon, characterized in that

- the under-layer (21) coating having been applied by PVD sputtering and comprises carbon and has a layer thickness of at least 11 micrometers,

and

- the upper-layer (22) has a lower coefficient of friction than the under-layer (21) and has a layer thickness of at least 1.5 micrometers.

2. The valve component according to claim 1, wherein the under-layer (21) has a layer thickness of at least 12 micrometers.

3. The valve component according to claim 1, wherein the under-layer (21) has a layer thickness between 20 and 30 micrometers.

4. The valve component according to any of the preceding claims, characterized in that the under-layer (21) comprises WC having been deposited by PVD sputtering of WC-targets in a vacuum chamber comprising argon and a carbon-containing gas.

5. The valve component according to claim 4, characterized in that the carbon-containing gas is acetylene gas.

6. The valve component according to claim 1, characterized in that:
between the coating (2) and the sliding surface (10) a Cr layer is deposited as adhesion layer (3) and the under-layer (21) comprises:

- a first-under-layer (211) comprising Cr and WC, wherein the first-under-layer (212) is formed having a multilayer structure comprising:
    - a first sub-layer deposited on the Cr adhesion layer (3), a second sub-layer deposited on the first sub-layer and a third sub-layer deposited on the second sub-layer,
    - wherein, if only Cr-content and WC-content in the first-under-layer (211) are considered, then :
        - the first sub-layer is a gradient layer, exhibiting decreased average concentration of Cr and increased average concentration of WC along its thickness in direction to the outermost layer with initial average concentration of Cr of 100 at% and initial average concentration of WC of 0 at.%,
        - the second sub-layer is a layer with constant average concentration of Cr and WC along its thickness, and
        - the third sub-layer is a gradient layer, exhibiting decreased average concentration of Cr and increased average concentration

of WC along its thickness in direction to the outermost layer with final average concentration of Cr of 0 at% and final average concentration of WC of 100 at.%,

- a second-under-layer (212) deposited on the first-under-layer (211) comprising WC + C or comprising WC + C + H,
- a third-under-layer (213) deposited on the second-under-layer (212) deposited as gradient layer, exhibiting decreased average concentration of WC along its layer thickness with final average concentration of WC of 0 at.%, and
- an upper layer (22) of DLC.

7. Method for producing a valve component comprising a substrate (1) with at least one sliding surface (10) being designed to be subjected to sliding against another surface during operation of the valve,

- wherein at least a portion of the sliding surface (10) is being coated with a coating (2)
- wherein the coating (2) comprises an under-layer (21) comprising tungsten and an upper-layer (22) comprising diamond-like-carbon,
- wherein the upper-layer (22) is deposited atop the under-layer (21)
- wherein the under-layer (21) is coated using a PVD sputtering process and comprises carbon and has a layer thickness of at least 11 micrometers, and wherein the upper-layer (22) has a lower coefficient of friction than the under-layer (21) and has a layer thickness of at least 1.5 micrometers.

8. The method according to claim 7, characterized in that a PVD sputtering process is used for depositing the under-layer (21) and a PA-CVD or PVD sputtering or ARC evaporation or HIPIMS is used for depositing the upper-layer (22).

9. The method according to claim 7 or claim 8, characterized in that between the coating (2) and the sliding surface (10) a Cr layer is deposited as adhesion layer (3), preferably using a PVD sputtering process.

10. The method according to claim 9,

- characterized in that the under-layer (21) comprises:
  a first-under-layer (211) comprising Cr and WC, wherein the first-under-layer (212) is formed having a multilayer structure comprising:
  - a first sub-layer deposited on the Cr adhesion layer (3), a second sub-layer deposited on the first sub-layer and a third sub-layer deposited on the second sub-layer,
  - wherein, if only Cr-content and WC-content in the first-under-layer (211) are considered, then :
    - the first sub-layer is a gradient layer, exhibiting decreased average concentration of Cr and increased average concentration of WC along its thickness in direction to the outermost layer with initial average concentration of Cr of 100 at% and initial average concentration of WC of 0 at.%,

  - the second sub-layer is a layer with constant average concentration of Cr and WC along its thickness, and
  - the third sub-layer is a gradient layer, exhibiting decreased average concentration of Cr and increased average concentration of WC along its thickness in direction to the outermost layer with final average concentration of Cr of 0 at% and final average concentration of WC of 100 at.%,

- a second-under-layer (212) deposited on the first-under-layer (211) comprising WC + C or comprising WC + C + H,
- a third-under-layer (213) deposited on the second-under-layer (212) deposited as gradient layer, exhibiting decreased average concentration of WC along its layer thickness with final average concentration of WC of 0 at.%, and an upper layer (22) of DLC,

wherein the deposition of the Cr layer Cr-targets are sputtered in argon atmosphere, following for depositing the first sub-layer WC-targets are sputtered by increasing sputtering power continuously while sputtering power continuously increases, while sputtering power at the Cr-targets can be maintained constant,

wherein for depositing the second sub-layer both the sputtering power of the Cr-targets and the WC-targets is maintained constant,

wherein for depositing the third sub-layer the sputtering power at the Cr-targets is continuously reduced till disconnection of the Cr-targets and the sputtering power at the WC-targets is maintained constant or increased continuously,

wherein for depositing the second-under-layer (212) a carbon-containing gas is introduced in the coating chamber and maintained constant, for example acetylene gas,

wherein for depositing the third-under-layer (213) the sputtering power at the WC-targets is reduced continuously till disconnection of the WC-targets while the acetylene gas flow is increased as well as bias voltage is increased till attained the desired condition for depositing the DLC upper-layer (22).

11. The method according to any one of claims 7, 9 or 10, characterized in that the under-layer (21) comprises WC deposited by PVD sputtering of WC-targets in a vacuum chamber comprising argon and a carbon-containing gas.

12. The method according to claim 11, characterized in that the carbon-containing gas is acetylene gas.