CemeCon Scandinavia A/S

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PVD CrN (Chromium Nitride) and DLC (Diamond Like Carbon) coatings on tools used in the medical industry.

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CemeCon Scandinavia has since the beginning af 2004 supplied CrN and DLC coatings for extensive use on tools in the medical industry. The coatings are made by using CemeCons PVD (Physical Vapour Deposition) processes based on the un-ballanced magnetron sputtering principle.

The PVD process

Prior to the PVD coating the parts are degreased in ultrasonic cleaning baths using demineralized water with alkaline/soup solution followed by 3 steps of rinsing in clean tap-water and finally followed by 3 steps of rinsing in clean demineralized water. Afterwards the cleaned tool parts are dried and mounted on stainless steel fixturing systems. The tools/fixturing systems are placed on stainless steel manipulation systems fitted for the PVD coating equipment. The manipulators holding the tools/fixturing are placed inside the process chamber of the coating equipment.

The PVD coating equipment used, is a CemeCon CC 800\9 MLT equipment which is state-of-the-art on an international scale. The PVD equipment is equipped with 4 Cr(Chromium)/C (Carbon) plates mounted on process-cathodes placed inside the process chamber. The Cr/C plates are made of high grade Cr and C. The high purity (99.95 %) of the Cr and C is specified and traceable. Prior to the coating process, the process chamber is pumped to high vacuum, and back-filled with clean thin gasses of nitrogen, krypton, argon and C_2H_2. The high purity (5.0) of the gases is specified and traceable. With the help of electrical power supplies connected to both anodes and cathodes inside the process chamber, the thin process gasses are made electrically conductive by creating a plasma.

The electrically conductive gases are made to bombard the Cr/C plates on the cathodes facilitating the evaporation ("sputtering") of Cr or C atoms into the process gas. The process gases react chemically making strong stable bonds of CrN and Cr_2N (for CrN) and Sp^2/Sp^3 of C (for DLC) and are ejected towards the surface of the tools. By this, a very hard, well adherent, mechanical stable and chemical inert 3 micro-meter thick layer of CrN or DLC is synthesized on all visible tool surfaces exposed to the process.

Quality control

The PVD process is fully automated and computer controlled with 100% control and traceability of all process parameters and consumable raw materials. All process data are sampled and stored, and for each production batch quality control is made on special quality control samples mounted in the batch.

Use and approval of CrN and DLC coatings for medical purposes

The PVD CrN and DLC coatings have in the last 15 years been used extensively on tools in the medical sector both in Denmark and internationally. CrN and DLC coatings are made both at CemeCon Scandinavia and at other PVD suppliers outside Denmark. CrN and DLC coatings are also being used on medical implants and are used on machine components in food industry. Related to these extensive medical and food applications, the PVD CrN and DLC coatings have also been FDA approved. In addition, the CrN and DLC coatings made at CemeCon Scandinavia have been approved “non-cytotoxic” according to DIN EN ISO 10993-5 tests made at the Fraunhofer IGB in Germany.