COATING PROCESS

Physical Vapor Deposition (PVD) Plasma Enhanced Chemical Vapor Deposition (PECVD)

DURALAR CENTURION

The Duralar Centurion deposition system is a versatile hybrid design for advanced coatings incorporating both PVD and PECVD technologies.
Thanks to this system it is possible to deposit thin films (metallic and ceramic) with a thickness from hundreds nanometers to tenth microns.
This system is tailored to meet industrial manufacturing needs, with high flexibility of use and configuration required by research. The deposited coatings can be used in different application fields with different features: hard protective coatings, self cleaning coatings, self lubricant coatings, functional surfaces and decorative films. The system configuration allows to coat a wide range of substrates such as metals, ceramics and heat – sensitive materials (polymers, brass, etc.).
The main features of the plant are the cathodic arc evaporator, the magnetron sputtering source and the plasma beam source driven by a RF power supply.

The Cathodic Arc Evaporator (CAE) is a well-known technology of deposition in vacuum, with the biggest advantages of high metal and plasma ionization and "simple" use in hard coating applications. Its typical defects in films, the droplets of metal, are reduced in the proposed source because of the presence of two electromagnetic coils that can "steer" the arc along the target surface, improving the quality of the deposited films.

The Magnetron Sputtering (MS) source can be used to evaporate a wide range of materials, from the more standard metals like Titanium, Chromium or Zirconium, to "softer" metals that normally cannot be evaporated by the Cathodic Arc technology, like Aluminum, Nickel, Silver, Gold. The presence of Two Magnetron Units driven by a Bipolar Pulsed Power Supply can be used to deposit multilayer films with a wide range of materials, creating alloys from different targets; moreover, the flexibility of that generator permits the creation of graded films (gradually passage between a compound to another), changing not only the chemistry of the plasma but also the waveform of the generator, choosing how much material we want to evaporate from each target during the various phases.

The Plasma Beam Source driven by a RF power supply is a versatile tool because it can be used as a support in Reactive Sputtering depositions, increasing the plasma ionization, in pretreatment phases, to etch the samples with high energy ions and as a PECVD source, efficiently cracking the desired precursor that is introduced in the chamber. Typical films that can be deposit with this source are, for example, DLC (at higher deposition rate and energy respect to standard ion sources), or optical films (oxides). The PECVD is equipped with the liquid delivery system because not only gas precursor, but also liquid precursors can be introduced in the deposition chamber. Typical liquid precursors for PECVD process are compounds that contain metal-oxides or silicon-oxides (like HMDSO, TEOS).

Parts being coated have independent bias control and are rotated in a planetary motion for optimized uniformity. The chamber is fully equipped with heaters, turbo pumps, a dry roughing pump, and mass flow controllers, as well as a delivery system for the liquid molecular diamond precursor. All hardware is controlled through an advanced programmable logic controller (PLC) and an intuitive human machine interface (HMI). Processes are automated through recipes.

PVD-PECVD Centurion plant features

CAE source	Current out: 0-200A Tension out: 80V Cooling: air
Magnetron sputtering source	Power out: 20kW Tension out: 1000V Cooling: water
PECVD source	Power out: 6kW Cooling: water Frequency: RF
Bias	Power out: 10kW Tension out: 1000V Current out: 33A Cooling: water
Temperature range	Room temperature up to 400°C
Maximum vacuum level	5*10-6 mbar
Speed of rotating table	1-5 rpm
Useful plasma volume	1000 mm Ø, 900 mm h
Thickness of the coatings	from hundreds of nanometers to tenth microns
Application field	Hard protective coatings, self cleaning coatings, self lubricant coatings, functional surfaces, decorative films.