ionLAB

plasma technology

ionics
surface technologies

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Ion Implantation technology and processing

IONICS has developed the ionGUN ion implantation system solving different technical and economic issues generally associated to the process. Enhance the surface properties of your material without any coatings and using an environmentally friendly technology. The innovation is supported by a Walloon initiative called WALIBEAM and several industrial majors in the fields of surface treatment of glass, metal and polymer are involved.

Applications

- Automotive: increased wear resistance and lowered friction coefficient of mechanical components avoiding the appearance of micro-cracks.
- Aeronautics: hard chromium alternative, enhanced resistance of super-alloys oxidation, ice-phobic, elimination of the electro-statics loads, better reliability of the electrical connectors.
- Connectors: increased corrosion resistance and densification of the noble metals, better performances with thinner metallic layers.
- Elastomers and polymers: lower friction coefficient and higher wear resistance and hardness- antistatic effects due to lower electrical insulation.
- Watchmaking – Jewellery: enhanced scratch resistance keeping the brightness and gloss, increase of the overall mechanisms life.
- Biomedical: prosthesis treatment for better biocompatibility and mechanical properties without any coatings; barrier to diffusion avoiding unexpected releases.
- Tools: increased hardness and wear resistance, lower friction coefficient under load.

Gains on materials

- Steels: surface hardening (x4 for stainless steels), strong decrease of the friction coefficient and exceptional abrasive wear resistance.
- Stainless 316L: from 400 to 1800 Hv on 10µm with digressive profile, friction coefficient divided by 2, pitting resistance multiplied by 10.
- Aluminium: surface hardening (x7), strong decrease of the friction coefficient, higher corrosion resistance.
- Copper and copper alloys: strong resistance to oxidation and abrasive wear, surface hardening (x4).
- Gold: surface hardening (x7), increased densities, strong decrease of porosity of electroplated layers.
- Titanium: surface hardening (x7), decrease of the friction coefficient.
- Magnesium: surface hardening (x3), cracking resistance and higher corrosion resistance.
- Platinum: surface nano-structuration (catalytic properties), reduction of the friction coefficient.
- Polymers (PC,PEEK,PMMA,PP,PU…): hardness increasing (x10) and creation of antistatic properties.
- Elastomers (NR,CR,EPDM…): hardness increasing and reduction of the friction coefficient.

Technology

A micro-accelerator of particles generates a highly energetic ion beam able to penetrate the surface of materials and to enhance their properties without any coating. The penetration depth might reach up to 10 microns and the treatment effects are still measurable until 1mm. Depending on the nature of the implanted ions and the process parameters, you may obtain chemical modification, doping effect, surface amorphisation, re-alloying or nano-structuring. The part temperature is controlled and maintained under critical threshold. The technology might be combined with other low-pressure technologies like PVD process to obtain even more breakthrough properties and performances.

Micro-implanter

The design of the ion micro accelerator is specially thought for industrial scale treatments avoiding the well-known hindrances and issues of such processes. Efficiency, reliability, simplicity and flexibility were the keywords during the development. The system is mainly composed of a particles micro-accelerator and a vacuum chamber (10^{-6}/10^{-7} mbar). The overall design of industrial line can be adapted by our engineers to your application: continuous or batch processes; additional plasma sources; scanning beams for large surface treatments; suitable for flat surfaces, loose parts or 3D complex shapes; and so on…

Process Advantages

- Low temperature surface treatment: bulk materials initial properties are preserved.
- No coatings: unpealable surface as the material itself is modified in its depth.
- Parts geometry respected: no machining resumption.
- Precise and localized surface treatment: optimized process time and final technical performances optimized.
- Electrical conductivity is not necessary: any insulating materials might be treated.
- Environmentally friendly dry process: no chemical waste.

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IONICS ▲ ZONING DES HAUTS SARTS ▲ 1 rue des Alouettes ▲ B-4042 Liers ▲ T. +32 (0)4 278 91 60 ▲ F. +32 (0)4 278 96 90
info@ionics-group.com ▲ **www.ionics-group.com**