



WINNER

1997 R&D 100 Awards Winner

Plasma Source Ion Implantation for Enhancing Materials Surfaces

Features

With our Plasma Source Ion Implantation (PSII) process, nitrogen or carbon ions are implanted into metallic surfaces to improve the surface hardness and wear characteristics of components for automobiles, aircraft, machine tools, and prosthetics, without requiring elevated target temperatures or employing carcinogenic or hazardous chemicals. PSII can also be used to enhance the adhesion of coatings applied to targets in an integrated plasma-based process. PSII provides the ability to enhance the surfaces of either large, complex parts weighing many tons or large numbers of individual components, leading to decreased treatment times and dramatic reductions in processing costs (compared with conventional ion beam implantation costs).

Applications

- Low-temperature surface hardening of chromium-plated dies, industrial tooling, and other high-precision components for increased component lifetimes and decreased manufacturing downtime.
- Surface treatment of aluminum and magnesium components for improved wear lifetime.
- Surface treatment for enhanced coating adhesion without the use of chemically hazardous pretreatments or interlayers.

Benefits

- Makes benefits of ion implantation practical by dramatically reducing treatment costs and complexity.
- Can be applied to large components or large batches of small components.
- Increases lifetime of treated components by up to 50 times.
- Produces no hazardous effluent.
- Can reduce the effluent from chromium-plating processes.
- Opens new areas of surface-treatment capabilities for lightweight alloys (e.g., aluminum and magnesium).
- Creates new market area (estimated to be hundreds of millions of dollars).