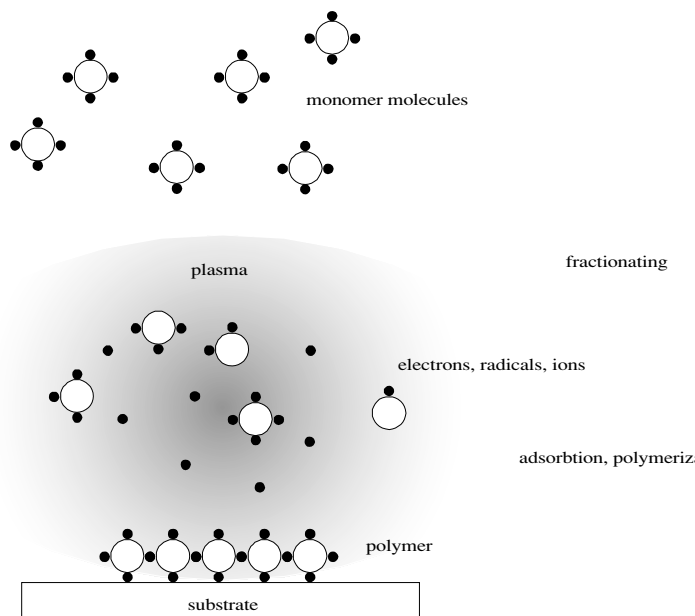


PLASMA POLYMERIZED COATINGS

Published, now and again

by MIDWEST TUNGSTEN SERVICE

The metallizing market is always in need of a faster, safer, more economical way to process metallized parts. Plasma polymerized topcoats may hold the key for some companies. Plasma polymerized coatings are applied inside the vacuum chamber immediately after metallizing, without breaking vacuum. Topcoating parts in the chamber saves time and effort formerly spent handling and coating parts, and curing traditional lacquer topcoats. Depending on the substrate being used, the basecoat process may also be eliminated, increasing savings. Also, no solvents are used in the process, making environmental requirements easier to meet.



In the plasma polymerization process, a monomer gas is pumped into a vacuum chamber where it is polymerized by a plasma to form a thin, clear coating. The monomer starts out as a liquid. It is converted to a gas in an evaporator and is pumped into the vacuum chamber. A glow discharge initiates polymerization. The excited electrons created in the glow discharge ionize the monomer molecules. The monomer molecules break apart (fractionate) creating free electrons, ions, excited molecules and radicals. The radicals adsorb, condense, and polymerize on the substrate. The electrons and ions crosslink, or create a chemical bond, with the already deposited molecules, creating a harder, denser coating. The process is done in a low pressure, low temperature plasma. This means the temperature in the chamber never really rises above room temperature. This is beneficial when using plastic materials that have a low deflection temperature. Deflection temperature is defined as the highest continuous operating temperature that the material will withstand without deforming.

The following steps describe the plasma polymerization process. Compare it to the traditional metallizing process.

1. The chamber is pumped down. Process gas is introduced into chamber.
2. The parts are exposed to a glow discharge. Depending on the substrate, exposing the parts to the glow discharge may eliminate the need for a basecoat. Refer to our TIPs on glow discharge for more information.
3. The process gas is evacuated.
4. A thin coat of aluminum is evaporated on the parts.
5. Process gas is introduced into chamber again.
6. The plasma polymerization process takes place.
7. Chamber is vented to atmosphere -OR- process gas is again evacuated and SiO or other hardcoatings are deposited.

Listed below are some of the advantages and disadvantages of using plasma polymerized coatings.

Advantages:

- Consistently even, thin, clear films can be deposited.
- Because the films are highly crosslinked, they have a low solubility and good corrosion resistance.
- Excellent resistance to most chemicals.
- The plasma polymer coatings have good adhesion to both metallic and plastic surfaces.
- Smooth, clear coating are obtained.
- Time saved in the coating and curing processes and in loading, unloading, and transferring parts

Disadvantages:

- Costly to retrofit equipment.
- Polymerized coatings have low abrasion resistance.
- Low deposition rates. Only very thin films can be deposited economically on high production items.
- The process doesn't discriminate against what is coated. Everything in the coating range of the polymerization process is coated, or can become part of the coating.
- The process, used in mass production, is still in its infancy. More capabilities will likely be available as improvements to the process occur.

In addition to manufacturing filaments, evaporants and evaporation boats, MTS carries Dow Corning 702 and 704 diffusion pump fluids and the polymer fluid used in plasma polymerization. We also carry boron nitride and graphite release agents, and a wide range of specialty inorganic chemicals to fully supply you with all your metallizing needs. Our highly trained staff continually researches products and processes that may benefit your operation. Please call us with any metallizing questions or problems you may have.

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