

Metalizing Plastic Parts

Vacuum metallization is a process that allows a user to create a layer of metal on a substrate of another material. Also called vacuum deposition, vacuum metalizing plastic involves heating the metal coating material until it vaporizes inside a vacuum chamber.

Flame spraying and arc spraying are two primary methods used to perform metallization on plastic parts. Both are low-cost and require minimal training.



Flame Spraying

This method has a high deposit rate and can become very thick. Specific areas are usually required for complex shapes. A handheld device is used to apply the coating, driven by a flame of oxygen and gas. The metallic powder is heated and melted, and the flame accelerates the mix, releasing the spray. Usually, the coatings are porous and rough.

Arc Spraying

This method utilizes an electric arc as its source. Two wires of the metallic material carrying direct current touch together at the tips, producing the energy to melt the wire. A stream of gas deposits the molten material

Vacuum Metalizing

Vacuum metalizing offers lower costs and does not require exposure to a chemical mixture. In this process, the parts are fixtured and placed on a turntable in the vacuum chamber. A filament, usually tungsten, is used to evaporate the metal. The fixture is rotated within the vapor cloud, and the metal is evaporated in a vacuum chamber at around 1500 °C. Lack of pressure in the vacuum lowers the boiling point of the metal and changes it from a condensed phase to a gaseous one, typically aluminum or copper. The vapor condenses, leaving a thin layer on the part. The process takes place within the vacuum chamber to prevent oxidation. If additional abrasion resistance is required, a secondary topcoat is applied.

Electroplating

This process involves immersing the part in a concentrated sulfuric and chronic acid tank for etching. The mixture etches the part's surface with microscopic holes, which are necessary to receive the first layer of metal in the electroless process just before electroplating. Neutralization in an alkaline mixture ensures the acids do not continue to degrade the part. The part receives an application of a catalytic film, then is cleaned to accelerate the film's reaction to the metal plating. Electroless plating is performed by applying a thin layer of nickel or copper to promote conductivity for electroplating. Electroplating applies a negative charge to the new coating, which is then immersed into the tank containing the positively charged chrome ions. Attachment occurs to the part, and the ions revert to neutral form, ensuring an even layer.