

The Vacuum Metallization Process

Vacuum metallization is a form of physical vapor deposition (PVD), a process of coating a metal such as aluminum or copper to a non-metallic substrate through evaporation. The most common metal used in vacuum metallization is aluminum, which is used for a variety of reasons including the relative low cost, thermodynamic, and reflective properties. The evaporation of the metal takes place by feeding aluminum wire onto heated sources or “boats”, which operate at approximately 1500°C (2700°F). The vacuum metallization process takes place in a closed chamber under high vacuum, which allows the liquid metal to go from a condensed phase to a vapor phase. The aluminum vapor adheres to the surface of the substrate, producing a metal coating on a film or fabric. The vacuum deposited aluminum coating is uniform across the entire web of the substrate.

Vacuum metallization is done for many reasons; aesthetically it adds a unique, eye catching appearance. Metallized substrates can have a highly reflective mirror like finish or be used in conjunction with other processes, like coating or laminating to create a decorative effect. Film that has undergone vacuum metallization can also be dyed and / or coated to give the substrate a unique color. Also, any vacuum metallized film can be laminated to a variety of other substrates such as leather, ABS, or polycarbonate to give the material a high-end metal appearance. Some additional decorative applications that utilize substrates produced through the vacuum metallizing process include:

- Label stock for a variety of applications
- Decorative surfacing film for appliances, point-of-purchase displays, & wallcovering.
- Personal care packaging

Vacuum metallizing is widely used to increase the functionality of a film or fabric. Vacuum deposited aluminum film is an ideal material for insulation applications due to the increased reflectance / radiant properties achieved with film metallization. Commercial and residential radiant barrier insulation materials get their functionality from the vacuum metallization process. Thermal insulation systems that are used to protect spacecrafts for critical space missions are constructed with multiple layers of polyimide films and other films that go through our film metallization process.

Another function derived from the vacuum metalization process is increased barrier properties. Metallization of a plastic substrates makes it an ideal material to achieve improved moisture and air barrier properties. Applications include food & beverage packaging and medical applications. The film metallization process also decreases the substrates light transmission making it an effective light barrier, which is critical to limit the amount of UV exposure. Dunmore is capable of adjusting the amount of vacuum deposited aluminum on a substrate. This gives you greater flexibility in performance characteristics that are critical for your design. Some functional barrier and insulation applications include:

- Aerospace thermal protection systems
- Medical packaging
- Window treatment

The Benefits Of Vacuum Metallizing

Vacuum metalizing use has grown in recent years for several reasons. These include the following:

- It provides the aesthetic appeal of metal parts while lowering the cost.
- It's safer than other processes, such as chrome plating. Vacuum metalizing does not require the dangerous mixing of chromium with cyanide.
- The purer process reduces the risk of chemicals in the part causing issues for people.
- It offers higher levels of resilience than other forms of metal coating.