Cork Tech TalkNews

Manufacturers of Waterbase, UV+EB Curable Coatings, Varnishes and Adhesives

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VACUUM METALLIZING - CONTINUES TO AMAZE

Visualize what happens when water vapor condenses on an iced cold water glass, or a tea kettle boils water and steam condenses on an adjacent surface, or a hot shower condenses water vapor on a bathroom mirror. These water vapor depositions are analogous to what happens when metals are melted, evaporated, and deposited on substrates.

This is metallizing, a relatively new technology that is allowing wondrous new materials to be created and new products to be marketed.

The metallizing industry dates back to the early 1930's with the Belgian invention of a sputtering device that demonstrated the ability to deposit a thin layer of silver on the then available flexible plastic material, cellophane.

The process was refined by an American gift wrap company in the late 1930's. This allowed the production and sale of decorative items. Later, in the 1945-50's, the technology was refined further by others to allow the commercialization of deposition of evaporated aluminum. This process allowed a very thin deposition of aluminum to be made on a variety of available film substrates. New plastic substrates that were developed during this period, i.e. polyester, allowed the commercial development of entirely new products such as reflective insulation, solar window films and shades, as well as magnetic, packaging, and static control materials.

Today metallizing is one of the world's fastest growing sectors of the converting industry, but just over 30 years ago the only avenue to a high quality metal packaging look was to use laminated rolled aluminum foil as a material. It was then in 1965, that a converter in Spain produced metallized paper and promoted it for beer labeling. The rest is history as they say. Soon after, cigarette packagers in the UK made the switch from aluminum foil to metallized paper. It was a case of acceptable functionality and attractive economics.

Almost any metal can be vaporized and used in the metallization process, but it is aluminum that has produced the most attractive economics and performance characteristics. For example, aluminum metallized polyester exhibits most of the key performance characteristics of aluminum foil. In snack food packaging metallized polypropylene finds use as a barrier to light, moisture and oxygen.

Considering economics, it is said that less than one ounce of aluminum is all that it takes to metallize one thousand square feet of paper. Compare this to the four to six pounds of rolled aluminum that is required to produce one thousand square feet of a comparable amount of very thin, light gauge aluminum foil.

The many advantages of metallized paper and polymer films have lead to widespread use in such products as:

- *electrical capacitors*
- *stamping foils for decorative uses*
- *flexible packaging for food products*
- *labels, cigarette and gum wrappers*
- *decorations, gift wrap and wall coverings*
- *metallic yarns and protective clothing*
- *reflective insulation, solar control, reflective signage, electro-sensitive papers and survival blankets*
- *magnetic video and audio tape*

The evaporative metallization process as we've discussed it so far, has it's limitations when other more sophisticated applications are considered. These would be applications demanding the deposition of highly uniform layers of metals and dielectrics as well as other complex materials.

In 1975, magnetron cathode (Electron Beam) processes were developed to vaporize a variety of metals, oxides and nitrides Semi-conductors have been produced using this technology and magnetron sputtering has been used in the coating of wide polymeric webs. Unique products that utilize these deposition techniques are: electrochromatic glare reducing rear view automotive mirrors, heads-up displays, heated defrosting windshields, illuminating electroluminescent panels, transparent conductors in touch screens, flexible circuits, auto glazing using selective wavelength coatings to retain clarity while reducing glare, light weight batteries, and, soon to come flat panel TV displays.

Since 1980, EB web polymer vacuum metallizing has produced metal deposition video tape. Magnetic alloys are producing new high definition 8 mm video tape and in the near future will produce HDTV tapes.

Now let's talk about the process itself. Metallizing is done by one of a number of evaporative techniques. These are: crucible (or boat), sputter electrodes, oven, induction, electron beam and the latest plasma enhanced chemical vapor deposition (PECVD). The latter specifically for the deposition of transparent non-conductive coatings. OVER

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Metal evaporation in a crucible or boat is the most commonly used commercial process.

Sputtering is a process that separates metal particles from a solid metal piece that is bom-barded by ions (electrically charged atoms).

EB metallizing is a newer technology wherein electrons bombarding the surface of a coating material produces thermal evaporation.

The most commonly used commercial metallizing process is one that evaporates aluminum in a vacuum chamber where it is deposited on thin polymer films or coated paper. In this process aluminum wire is fed to a heated crucible or (boat) where it is melted. Under vacuum, the aluminum vapor is deposited onto a substrate in roll form as it moves past an aperture window. Deposition is dependent upon feed rate of the metal, temperature of the evaporation boats, and the speed of film passage. In this process once the entire roll has been metallized, the boats are cooled, the chamber is vented to atmospheric pressure, and the metallized roll is removed for further processing.

In paper metallizing, pre-coat aqueous polymer primers are used to provide a smooth base for metallization. After metallization, an over coating of an imprintable aqueous polymer is applied since aluminum oxidizes readily.

Both two dimensional (prismatic) and three dimensional (holographic) visual effect materials are produced by microembossing coatings on metallized substrates. Light that hits the shinny embossed surface is separated into the various colors of the rainbow. These materials are finding applications in security devices, decorative packaging and gift wrap.

Technological advancements in the ability to selectively pattern deposit high resolution vacuum metallized coatings, is finding applications in authentification holograms, electronic surveillance article tags, electrostatic discharge materials, reflective films, solar protective films, anticounterfeit currency threads and microwave heating susceptor panels. The latter allows the selective heating and the subsequent browning and crisping of packaged microwavable food products.

Transparent holograms, through which a print can be seen, are another new security development resulting from a proprietary sputtering coating process.

Vacuum metallizing is a continually evolving and changing technology, one that is in the forefront of future sophisticated technological advancement.

As you look to pre-coats and top coats for these evolving technologies, ***LOOK TO CORK!***

LOOK TO CORK! for all your coating needs.