Chips Packets/ Metallised Film/PVC

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1. Types of Plastic Film

Plastic Film is a thin continuous material. Thicker plastic material is called a 'Sheet'. When it is in the form of a thin membrane, it is called a 'Film'. They are usually used to separate areas or volumes, to hold items, to act as barriers, or as printable surfaces.

Plastic films are used in a wide variety of applications. These include: packaging, plastic bags, labels, building construction, landscaping, electrical fabrication, photographic film, film stock for movies, video tape, etc.

Plastic Film can be clear or colored, plain or printed, single layered or multilayered, and also combined with other materials such as aluminum and paper. Thus, the only thing that all plastic film really has in common is that it is flexible in nature, as used in grocery bags, as opposed to rigid, as used in soft drink bottles and butter tubs.

- Single Layer Film
- Multilayer Film
- Aluminium Foil Film
- Metallized Film

It can be made of almost all kinds of plastic – Polyethylene, Polypropylene, Nylon, Polyvinyl Chloride, etc. Hence, we could also classify the plastic films on the basis of the kinds of plastics they're made of:

- Polyethylenes
    - High Density Poly Ethylene (HDPE):

- Low cost, Easily Processed
  - Low softening and melting points
  - Compatible with foods and most household chemicals
  - Tends to be translucent
  - Good moisture barrier, poor oxygen barrier
  - Used for:
    - Some industrial and carry-out bags
    - Drum and box liners
    - Some laminates
- Low Density Poly Ethylene (LDPE):
  - Low cost, Easily Processed
  - Films are soft and clear
  - Lowest softening and melting point (good for heat sealing)
  - Compatible with foods and most household chemicals
  - Fair moisture barrier, very poor oxygen barrier
  - Very high elongation (desirable for stretch wrap)
  - Used for:
    - Stretch wrap Linear Low Density Poly Ethylene (LLDPE)
    - Heat seal film/coating
    - Bags and Liners
    - Shrink film

- Polypropylene (PP)
  - Low Cost, Easily processed, good chemical compatibility
  - Three dimensional parts translucent, colourants added
  - Oriented PP film is clear, stiff and glossy
  - Good moisture barrier, poor oxygen barrier
  - Higher softening point than PE (Polythylene)
  - Often metallized and printed
  - Used for:
    - Food pouches and bags – most snacks
    - Clear wraps

- C

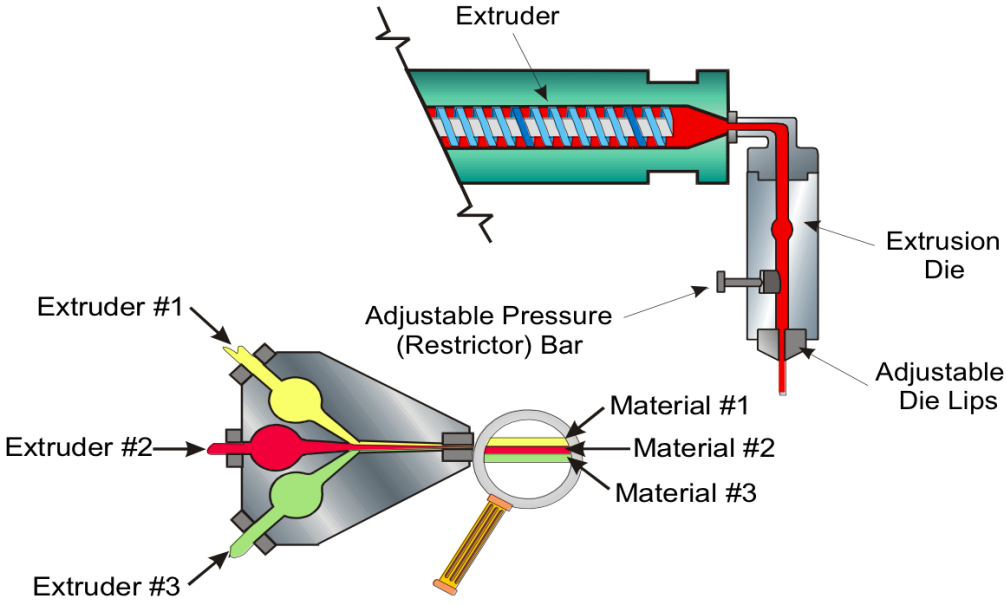
lear label stocks

Plastic film can also be made of Polystyrene (PS) and Polyethylene Terepthalate and other types of plastics.

2. How are Plastic Films made?

Plastic Films are usually made by either of the two processes:

- Orientation
  Most plastic packaging films are oriented. This consists of stretching the film in one or two directions. Orientation dramatically improves properties such as stiffness and tensile strength while reducing elongation. Orientation also increases film yield.
- Lamination
  A laminate is a product made by bonding together two or more materials whether plastic, paper or foil. There is no perfect, universal packaging material. Laminates assemble materials with desirable properties to create an optimum combination.



Laminate appearance have a good aesthetic appearance – they have clarity, surface gloss and reflective metallics.

3. Metallized Film

Metallized films are plastic films coated with a thin layer of metal, usually aluminium. They offer a glossy, metallic appearance of an aluminium foil at a reduced weight and cost. They also have improved barrier properties to moisture, oils, air and odors. The shiny surface of the aluminium is also attractive to look at.

Why metallize films?

Metallized films have properties better than both aluminium and plastic individually.
The properties of the film remain, such as higher toughness, the ability to be heat sealed, and a lower density at a lower cost than an aluminium foil. This gives metallised films some advantages over aluminium foil and aluminium foil laminates. It was thought that metallised films would become a replacement for aluminium foil laminates, but current films still cannot match the barrier properties of foil.

Why Aluminium Foil?

- Intact Foil is a 100% barrier to all gases and moisture
- Best deadfold properties
- Easily punctured
- Reflects radiant heat
- Decorative appeal – all reflective metallics are aluminium
- Improves film barrier properties of light fastness
- Improved oxygen barrier – upto 50 times for OPP and upto 10 times for PET
- OPP, PET and PA (nylon) are the most commonly metallized packaging

4. Uses of Metallized Film

   Metallized films are widely used for decorative purposes and food packaging, and also for specialty applications including insulation and electronics.

   Some packages appear to be made with more than one material, but actually are made with just one specialized plastic film. A potato chip bag is a good example. Although it looks like it has an

aluminum inner layer, it really is a micro-thin deposit of aluminum on the polypropylene, which is vaporized into the film (like a coating). This is referred to as “metallized” polypropylene. The alu- minum coating is needed to block out ultraviolet rays, which would cause product degradation, and the polypropylene is needed to resist oxygen, which would turn the fats in the product rancid.

a) Decoration: Metallized films were first used for decorative purposes as Christmas tinsel, and continue to be used for items such as wrappers and ribbons. The metallic helium filled novelty balloons given as gifts are made of metallised BoPET and often called Mylar balloons commercially.
b) Packaging: Both metallised PET and PP have replaced foil laminates for products such as snack foods, coffee and candy, which do not require the superior barrier of aluminium foil. Metalized nylon and polyethylene are used in the meat export market. The controlled permeation extends shelf life. Metalized films are used as a susceptor for cooking in microwave ovens. An example is a microwave popcorn bag.
   Many food items are also packaged using metallised films for appearance only, as these produce a package with greater sparkle when compared to competing products that use printed paper or polymer films.
c) Insulation: Metalized PET films are used in NASA's spacesuits to make them radiation resistant and keep astronauts warm, and in proximity (aluminized) suits are used by AR-FF fire fighters for protection from the high amount of heat released from fuel fires. Silvered emergency blankets are also used to conserve a shock victim's body heat. These reflective materials might also be used as part of industrial and commercial insulation (for example, insulated shipping containers.) Insulating blankets made with Metalized PET were also used as insulation in aircraft until safety concerns resulted in their deprecation. In particular, it was found to be a major cause of the in-flight fire of Swissair Flight 111 on September 2, 1998.

d) Electronics: Metalized films are used as a dielectric in the manufacture of a type of capacitor used in electronic circuits, and as a material in some types of antistatic bags.

Because metallized films are more expensive, and if the product isn't sensitive to oxygen it's not an economical choice to use them. Packaged ready-to-eat cereals are usually low in their unsaturated oil content and so rancidity isn't an issue with them. Plastic films do a good job of providing a moisture barrier, though, and high humidity is the biggest threat to quality in dry cereal products.

5. Manufacturing Process

Films can be made of various kinds of plastics – LDPE, LLDPE, HDPE, etc

Paper and film metallizing is utilized in the packaging and decorative market segments.

Vacuum coating and metallizing is the process of adding a thin film of aluminum or other coating to a material.

In principle, the process calls for the evaporation of the coating material inside a vacuum chamber, after which it condenses onto a web of substrate as it passes through.

- Vacuum coating machines

A vacuum coater, also referred to as a vacuum metallizer or barrier coating machine, consists of a vacuum chamber which has been evacuated to, typically, 0.0005 mbar.

Inside this chamber, aluminum wire is fed onto individual, resistance-heated inter-metallic evaporators, where the aluminum becomes molten and evaporates.

The flexible substrate, supported on a chilled process drum, passes over the evaporation source at speeds of up to 1000 m/min. The aluminum vapor condenses onto the substrate and so creates the coating layer.

- Plasma treatment

A plasma treatment unit can also be used as part of a vacuum coater system in order to enhance metal adhesion and/or to

improve the substrate's qualities as a barrier against oxygen and water vapor transmission. Here, the surface of the web is hit by plasma just prior to the coating process.

The plasma is formed by applying an electrical voltage to a gas, or combination of gases. In addition to removing moisture and other contaminants, plasma treatment acts to increase the number of nucleation sites by the introduction of polar groups, resulting in a coating with a homogeneous surface morphology and fewer defects

6. Properties of Metallized Film

- Mechanical properties
  - Tensile strength
  - Stiffness
  - Coefficient of Friction
  - Use temperatures
  - Elongation
  - Formability
- Barrier Properties
  - Oxygen barrier
  - Essential oil barrier
  - Water vapour barrier
  - Light barrier

Metallized Films are more expensive hence need to be used only where

7. Problem with Metallized Film

While these types of food packaging products are great for keeping out contaminants, they're not good candidates for inspection using metal detectors. Metal detectors use high frequency radio signals (50 – 700 KHz) to detect the presence of metal in food or other products. A digital signal processing system analyzes certain signals and sends an alert if metal is present and could cause a food hazard or safety issue.

Even with drop-through metal detection technology, there typically is not enough room in the VFFS machine to mount a reject mechanism. Therefore, there is no easy way to reject a single product. (A possible work around is to give a signal to the bagger to make a double bag when a contaminant is found. The double bag, coupled with an audio alarm, signals the person packing the case that there has been a metal hit.)

With these process and material obstacles in place, X-ray equipment is the better solution to address snack food inspection challenges. X-ray systems produce density images that are analyzed for irregularities. X-ray inspection is one of the first lines of defense to identify the presence of foreign contaminants in food products before they have the chance to leave the processing plant. Unlike metal detectors that offer protection from many types of metal contaminants encountered in food production, X-ray systems can 'ignore' the packaging and find virtually any substance that is denser or sharper than the object containing it.

Additionally, in the case of bars and other similar snack products, X-ray inspection can be used for spotting missing or broken pieces.

Recycling
https://www.youtube.com/watch?v=1blYz4NZ-J0
http://www.packagingdigest.com/smart-packaging/new-breakthroughs-flexible-packaging-recycling-0