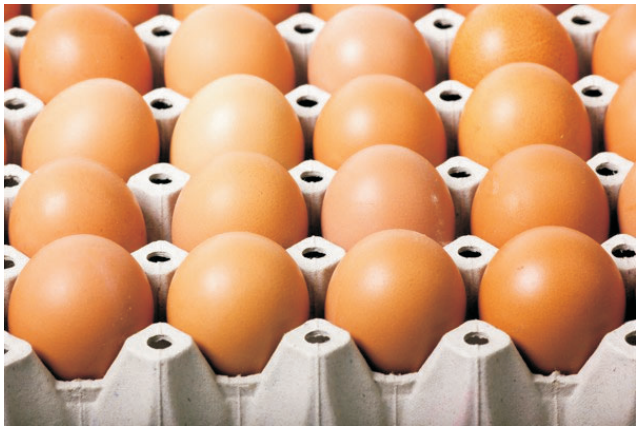
Food Packaging: Materials and Forms

FOOD PACKAGING MATERIALS include metal, glass, paper, and plastic. Sometimes material combinations are used to design food packages. Hermetically sealed and tamper-proof containers are also common in food packaging. Typically, food packages are one of three types: primary, secondary, or tertiary.



Objective:

Review food packaging standards for materials and types.

Key Terms:

hermetically sealed
primary containers
secondary containers
tertiary containers

Materials and Types of Food Packaging

Materials used to make food packaging must be functional for the purpose. The company should avoid overdoing it. If possible, the packaging should be recyclable.

FIGURE 1. Identify the recyclable food containers.

UNDER INVESTIGATION...

LAB CONNECTION: Evaluate Fast Food Packaging

This experiment could be conducted at home or in the classroom. If you want to do this experiment in the classroom, ask for the permission of your instructor. Obtain food packaging from places such as Arby's®, Burger King®, Dairy Queen®, KFC®, McDonald's®, Subway®, Taco Bell®, Wendy's®, and White Castle®. Obtain items such as cups, sandwich and fry containers, utensils, boxes, and bags. Evaluate the items for the packaging amount, effectiveness, and recyclability. Design a data table. Cleaned packaging could be displayed, or a presentation could be given to compare the packaging ideas and display your data table.

FOOD PACKAGING MATERIALS

The four basic packaging materials used by the food industry are metal, plant matter (e.g., paper and wood), glass, and plastic. Many food package containers combine two or more of these materials. Combination types of packaging materials allow for the best possible container to be formed. These four basic packaging materials can be engineered into various forms.

FIGURE 2. Metal cans are available in many sizes and shapes. Some metal containers may be purchased with pull-tabs for easy opening.

Metal Packaging

Metal cans are made of steel or aluminum. First, the bottom is formed. Then the food is added. Finally, the lid is attached. Metal cans with paper labels have the labels attached following filling.

Glass Packaging

Glass jars are inert (inactive), recyclable containers that hold a variety of food products. They often have metal lids and are covered with paper labels.

Paper Packaging

Paper products (e.g., boxes and bags) are used to hold food products. Paper that comes in direct contact with food products must meet FDA standards for purity and is often unable to be recycled because

FIGURE 3. Paper-based orange juice containers may be coated with wax. Some orange juice containers use aseptic (disease-free) packaging designed in laminated layers of paper, foil, and plastic.

UNDER INVESTIGATION...

LAB CONNECTION: Cornstarch Plastic

You can make a plastic from cornstarch. Plastic is a polymer. It is similar but not as sturdy as the plastic used by manufacturers for recycled food packaging and utensils. Place one tablespoon of cornstarch, two drops of corn oil, one tablespoon of water, and a few drops of food coloring (if desired) into a small freezer-strength bag. Mix well. Close the bag, leaving a small opening for steam to escape. Microwave the mixture in the bag for 20 seconds. Let it cool enough to touch it. Look at the structure. See if you can form it into shapes. Make a ball, and see if it will bounce. After it cools, it will become brittle. You can obtain more information from http://www.scienceoffcenter.org/science/310-corn-starch-plastic and http://www.youtube.com/watch?v=xLzaI95x5MQ.

of the addition of waxes and coatings. Depending on use, some paper packages are bleached, lacquered, impregnated with plastic and resin, or laminated with aluminum to increase tear resistance, reduce gas permeability, and improve appearance.

Plastic Food Packaging

Several types of plastics can be used to store food products (e.g., cellophane, cellulose acetate, nylon, and Saran). Newer plastics contain cornstarch, which increases biodegradability.

FOOD PACKAGE TYPES

Food packages are divided into three main types: primary, secondary, and tertiary. Each type has a specific function and location. Many packages used to hold food products are manufactured at one factory site and filled at another. Other packages are made just prior to being filled and are called form-fill-seal. To protect foods from being contaminated or to keep gas moisture from being exchanged, many packages are hermetically sealed. **Hermetically sealed** is to be made airtight by fusion or sealing.

FIGURE 4. The plastic bag that holds the breakfast cereal flakes is the primary container. The outside box that holds the plastic bag is the secondary container.

Primary, Secondary, and Tertiary Containers

Primary containers are reusable boxes or cartons that come in direct contact with the food product. An example of a

DIGGING DEEPER...

UNCOVERING ADDITIONAL FACTS: Recycling Food Packaging

Food packaging made from glass, paper, aluminum, steel, and plastic can be recycled or made into new items. Recycling can be closed-loop recycling, such as aluminum cans, where the solid waste is made into the same product again. Biodegradable products will decompose in landfills. Some plastic products (e.g., compost bags for trash and corn-based plastic) are biodegradable. The "Marine Debris Timeline" at http://www.epa.gov/gmpo/edresources/debris_t.html has a chart of items and the time it takes for them to break down in the ocean, including the following items:

- Plastic bottles made from petroleum: 450 years
- Aluminum cans: 200 years
- Foam cups: 50 years
- Waxed milk cartons: 3 months
- Tin cans: 50 years
- Glass bottles: Undetermined
- Plastic soda pop rings: 200 years
- Photodegradable soda pop rings: 35 years

primary container is the plastic bag that holds breakfast cereal. **Secondary containers** are reusable boxes or cartons that hold several primary containers together. An example of a secondary container is the cereal box that holds the inner bag. **Tertiary containers** are reusable boxes or cartons that hold several secondary containers together. An example of a tertiary container is the shipping box that holds several cereal boxes.

Summary:

Common materials used in food packaging are metal, glass, paper, and plastic. Sometimes combinations of these materials are used to design food packages. Concern has been raised about the amount of unnecessary packaging and whether packages can be recycled. Many food containers are hermetically sealed to provide consumer protection and airtight seals. Packages can be manufactured off site or through form-fill-seal processes. Food packaging is typically one of three types: primary, secondary, or tertiary.

Checking Your Knowledge:

1. List three types of plastic food packaging.
2. What are four types of materials used in food packaging?
3. How are recyclable plastics made?
4. What is a hermetically sealed package?
5. Describe a form-fill-seal manufacturing facility.

Expanding Your Knowledge:

BPA, or bisphenol A, is an industrial chemical that has been used to make some plastic food containers and water bottles since 1960. BPA is used to coat the inside of food cans and bottle tops. Some consumers are concerned that BPA may leach into the food. In a study that tested 2000 people, 90 percent had BPA in their urine. The manufacturer of BPA listed the following quotes from the FDA. "BPA is safe at the very low levels that occur in some foods, and the use of BPA in food packaging and containers is safe."

The FDA's current assessment is based on a review by FDA scientists of hundreds of studies, including the latest findings from new studies conducted by the agency's National Center for Toxicological Research (NCTR). BPA has possible negative health effects on infants and children. So the FDA banned the use of BPA in baby bottles and cups. If you are concerned with BPA, substitute fresh foods for canned foods, avoid heating plastics in the microwave or dishwasher, and use other materials for food containers instead of plastic. Conduct your own research, and create a PowerPoint to share with your class based on your findings.

Web Links:

BPA
http://www.factsaboutbpa.org/

BPA: Baby Bottles and Cups
http://www.nytimes.com/2012/07/18/science/fda-bans-bpa-from-baby-bottles-and-sippy-cups.html?_r=0

Concerns About BPA
http://www.mayoclinic.com/health/bpa/AN01955