



Unit II - Topic 5

Containers and closures for carbonated beverages

Carbonated Beverage Containers

One common item that presents some interesting material property requirements is the container for carbonated beverages. The material used for this application must satisfy the following constraints:

1. provide a barrier to the passage of carbon dioxide, which is under pressure in the container;
2. be nontoxic, unreactive with the beverage, and, preferably, recyclable;
3. be relatively strong and capable of surviving a drop from a height of several feet when containing the beverage;
4. be inexpensive, including the cost to fabricate the final shape;
5. if optically transparent, retain its optical clarity; and
6. be capable of being produced in different colors and/or adorned with decorative labels.

All three of the basic material types—metal (aluminum), ceramic (glass), and polymer (polyester plastic)—are used for carbonated beverage containers (as shown below). All of these materials are nontoxic and unreactive with beverages. In addition, each material has its pros and cons. For example, the aluminum alloy is relatively strong (but easily dented), is a very good barrier to the diffusion of carbon dioxide, is easily recycled, cools beverages rapidly, and allows labels to be painted onto its surface. However, the cans are optically opaque and relatively expensive to produce. Glass is impervious to the passage of carbon dioxide, is a relatively inexpensive material, and may be recycled, but it cracks and fractures easily, and glass bottles are relatively heavy. Whereas plastic is relatively strong, may be made optically transparent, is inexpensive and lightweight, and is recyclable, it is not as impervious to the passage of carbon dioxide as aluminum and glass. For example, you may have noticed that beverages in aluminum and glass containers retain their carbonization (i.e., “fizz”) for several years, whereas those in two-liter plastic bottles “go flat” within a few months.



A familiar item fabricated from three different material types is the beverage container. Beverages are marketed in aluminum (metal) cans (top), glass (ceramic) bottles (center), and plastic (polymer) bottles (bottom).