

PROPERTIES AND APPLICATIONS

Metal has good barrier properties to gases, light, and odors, and it withstands high temperatures. Typical metals used in food packaging are aluminum and steel.

Metal has been widely used as food packaging since the early 19th century. The invention of the canning process made it possible to not only store, but also conserve food directly in the packaging.

Nowadays beverage and food cans make up most of the metal packaging, but metal is also used, for example, in tubes, trays, lids, foils, and many multilayer materials.

COMPOSITION OF METAL PACKAGING

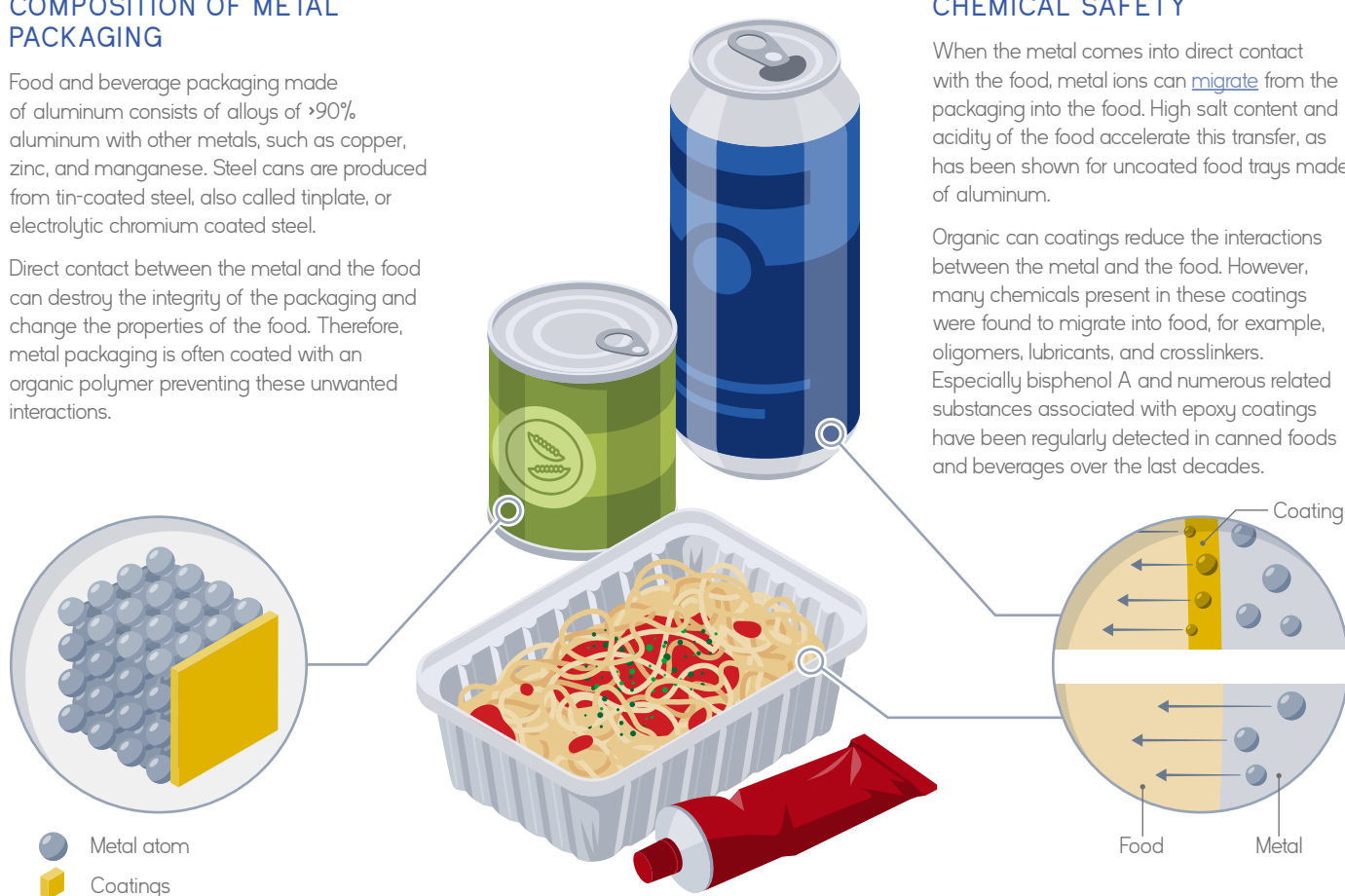
Food and beverage packaging made of aluminum consists of alloys of >90% aluminum with other metals, such as copper, zinc, and manganese. Steel cans are produced from tin-coated steel, also called tinplate, or electrolytic chromium coated steel.

Direct contact between the metal and the food can destroy the integrity of the packaging and change the properties of the food. Therefore, metal packaging is often coated with an organic polymer preventing these unwanted interactions.

CHEMICAL SAFETY

When the metal comes into direct contact with the food, metal ions can migrate from the packaging into the food. High salt content and acidity of the food accelerate this transfer, as has been shown for uncoated food trays made of aluminum.

Organic can coatings reduce the interactions between the metal and the food. However, many chemicals present in these coatings were found to migrate into food, for example, oligomers, lubricants, and crosslinkers. Especially bisphenol A and numerous related substances associated with epoxy coatings have been regularly detected in canned foods and beverages over the last decades.



END-OF-LIFE

Depending on its applications, the end-of-life options vary for metal food packaging. If the packaging mainly consists of metal (e.g., cans, lids), it can be separated and recycled repeatedly. For packaging items that contain thin metal layers (e.g., beverage cartons), the recovery of these metal layers is economically

not feasible, and sometimes even technically impossible. Metal packaging ending up in a landfill or the environment does not biodegrade. While aluminum is also resistant to weathering and corrosion, degradation of tinplate due to corrosion is slightly faster.



RECYCLING

of metal food packaging

Metals are a valuable raw material that have been melted down and reused for thousands of years. Today, the recycling of aluminum and steel food packaging plays a major role in keeping these materials in the loop.

Depending on the waste management system, aluminum and steel food packaging is favorably collected in single streams or, alternatively, separated from the residual waste. Especially food and beverage cans achieve high recycling rates in many countries.



How is metal recycled?

RECYCLING OF ALUMINUM CANS

Before recycling, aluminum cans are shredded, and the lacquers and coatings are removed by heating. Then the material is melted in a furnace at 750°C and cast into ingots that are later rolled into sheets to produce parts that form new aluminum cans. Ideally, the composition of the aluminum alloy is controlled and adjusted during recycling to avoid the accumulation of unwanted metals. Aluminum cans are typically made of about 70% recycled material, but from a technical point of view this percentage could be increased.

RECYCLING OF STEEL CANS

Steel cans are easily separated from other waste due to their magnetic properties. Then they are cleaned of grease and non-metallic materials (e.g., paper labels) and undergo a detinning process removing the internal layer of tin. Virgin molten iron is added to the detinned steel in a furnace at up to 2000°C. Impurities are removed by blowing high purity oxygen into the metal. The recycled steel is then cast into solid slabs, rolled into coils and ready to be used for new steel cans.

What needs to be addressed?

RAW MATERIALS AND ENERGY USE

Metals can be remelted indefinitely and mixed with other elements to achieve new alloys for different applications. Recycling of metal food packaging requires a lot of energy because of the high melting temperatures. However, in comparison to the production of virgin materials, the recycling process saves energy and raw materials.

ORGANIC COATINGS

The organic coatings of food and beverage cans are completely removed during recycling. Therefore, coatings always need to be freshly applied – regardless of whether a metal can is made of virgin or recycled material. Since coatings are the main source of chemical migration from food and beverage cans and prevent direct contact with the metal, the chemical safety is generally not influenced by using virgin or recycled metal.

