

# MULTIMATERIAL food packaging

## PROPERTIES AND APPLICATIONS

Packaging consisting of several layers of different materials is widely used in the food and beverage industry and termed as "multi-layer multimaterial packaging".

Multimaterial food and beverage packaging often has sophisticated compositions. In most cases, this packaging is made of paperboard, plastic polymers and/or aluminum.

The most prominent example is the beverage carton, which was invented a century ago. It is light-weight, stable and nowadays often reclosable.

## COMPOSITION OF MULTIMATERIAL FOOD PACKAGING

Beverage cartons typically consist of about 75% paperboard, 20% plastics and up to 5% of aluminum foil. Paperboard provides stability and resistance, plastic layers (most often polyethylene) are applied to prevent leakage and protect against external moisture, and aluminum is a barrier against light, oxygen, and chemical migration.

Metal-coated cardboard and laminated films made of aluminum and plastics are further examples of multimaterial food packaging. They are typically used in the form of pouches, tubes, bags, and trays. Adhesives are always needed in the production of multimaterial food packaging, and printing inks are commonly used on the outside of the packaging.



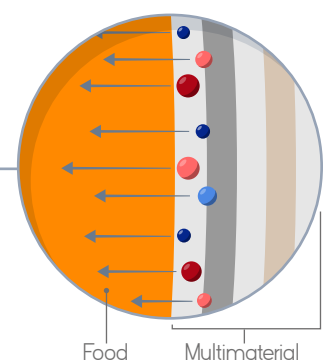
Plastic Aluminum Paperboard



## CHEMICAL SAFETY

When addressing [chemical migration](#) from multimaterial food and beverage packaging, the primary focus should be placed on the material that is in direct contact with the food. However, chemicals from the outer layers of the packaging, the adhesives, and the printing inks can migrate if there is no barrier layer present.

Additionally, chemicals can be transferred from the printed outside to the unprinted inside layer during production. This is because multimaterial sheets are often stored in reels, leading to chemical migration of printing ink components from the outside of the packaging into the food ('set-off migration').



## END-OF-LIFE

Multimaterial food packaging is commonly incinerated or sent to landfills in many countries. For fiber-based multimaterial packaging such as beverage cartons, separated collections and optimized sorting processes are currently being implemented in many places.

With these approaches, the multimaterial packaging can then enter recycling processes where the fibers are recovered. However, plastics and aluminum that are used in multimaterial packaging cannot be recycled efficiently at present.



# RECYCLING

## of multimaterial food packaging

Multimaterial food packaging often consists of thin material layers that are difficult to separate. However, separation into single-material streams is a prerequisite for high-quality recycling. Hence, recycling of multimaterial food packaging is challenging.

Nevertheless, in the view of a circular economy, increasing efforts are being made to recycle multimaterial food packaging, but the use of these recycled materials in direct contact with food seems to be out of reach at the moment.



## How are multilayer multimaterials recycled?

### RECYCLING OF BEVERAGE CARTONS

During recycling of beverage cartons, paperboard fibers are separated from the plastic and aluminum layers by suspending the material in water. The fibers are then used in different recycled paper products, but not in new beverage cartons or other packaging with direct food contact. The remaining plastic and aluminum layers can be extracted as composites and are typically used in products with lower quality requirements, such as plastic pallets and crates.

### RECYCLING OF LAMINATED FILMS

Industrial processes for recycling laminated films made of plastic and aluminum layers are not yet broadly available. Even if such processes were implemented in the future, it does not seem likely that the recycled materials could be used again in direct contact with food.

## What needs to be addressed?

### NO CLOSED LOOP

The examples presented earlier show that complete recycling of beverage cartons and other multimaterial packaging is currently not feasible and that recovered materials are not used in new food and beverage packaging. Hence, these recycling processes are not truly circular, but lead to a downcycling of the material.

### PACKAGING SAFETY

The recycled materials derived from multimaterial food packaging are not reported to be used in direct contact with food. Therefore, potentially elevated levels of chemicals present in the recycled materials do not need to be specifically addressed in the context of food packaging safety.

