



# ECOSIGN

## Ecodesign for food packaging

### Unit 04: The quality of the food packaging and the shelf life



## Content unit V, Ecodesign for food packaging

### 4.1 Packaging and avoiding food degradation

#### 4.1.1 Notions on EU Legislation on Food Packaging

#### 4.1.2 Functions of food packaging.

## After learning this unit, the student will be able to:

- Understand the concept of packaged product quality and the shelf life of packaged food

## Concepts of EU Food Packaging Legislation

- EU legislation mainly covers 'Food Contact Materials (FCM)'.
  - COUNCIL REGULATION (EC) 1935/2004 states that any material or object intended to come into direct or indirect contact with foodstuffs must be sufficiently inert that it prevents the transfer of constituents to foods in more than the limit on which they would endanger human health or cause an unacceptable change in the composition of the food or an alteration of its organoleptic properties.
  - COMMISSION REGULATION (EC) 2023/2006 ensures that the manufacturing process is well controlled so that the FCM specifications remain in compliance with the legislation. The safety of FCM is assessed by the European Food Safety Authority (EFSA). On the EFSA website, information can be obtained on the substances to be used in materials that come into contact with food.
- Specific measures in the legislation for: plastics (including recycled plastics), ceramic materials, regenerated cellulose films and active and intelligent materials.



### **Plastics** - EC regulation 10/2011

- ❑ It contains a positive list of monomers and additives that can be used in FCM.
- ❑ Plastic, mono- and multilayer plastic, as well as plastic coatings and seals used to close bottles and jars, are regulated.
- ❑ Based on the toxicity data of each specific substance for the substances on the EU list, the specific migration limits of the specific substance (LMS) were established.
- ❑ The Global Migration Limit (OML) of 60 mg / kg of food or 10 mg / dm<sup>2</sup> of plastic that comes into contact with the food.
- ❑ To ensure the safety, quality and compliance of the plastic materials, the appropriate data on the composition of the intermediate materials are the subject of a "Declaration of Conformity" (DoC), based on supporting documentation.
- ❑ **Mechanically recycled plastics**, EC 282/2008, provides for an FCSA authorization to be granted by EFSA.
- ❑ **Regenerated cellulose films** - are covered by Directive 2007/42 / EC, which contains a list of substances that can be used for their manufacture. In addition, printed surfaces can not come into contact with food. At the marketing stage, cellulose films intended to come into contact with food must be accompanied by a written declaration

## Specific measures in legislation II

- ❑ **Ceramics** - have not been individually regulated, Directive 84/500 / EC (currently under review) sets migration limits for cadmium and lead, heavy metals known to migrate frequently to low levels.
- ❑ **Active and intelligent materials** - prolong the shelf life by releasing or absorbing substances into or from food, to or from the environment. CE / 450/2009 norms establish a list of the materials allowed for the manufacture of these materials. Norms include, for example: Absorption of substances inside food packaging, such as liquid and oxygen, release of substances in foodstuffs, such as preservatives, indications by labeling about food expiration.
- ❑ Active materials do not include systems that absorb substances that enter the atmosphere, such as active oxygen barriers.

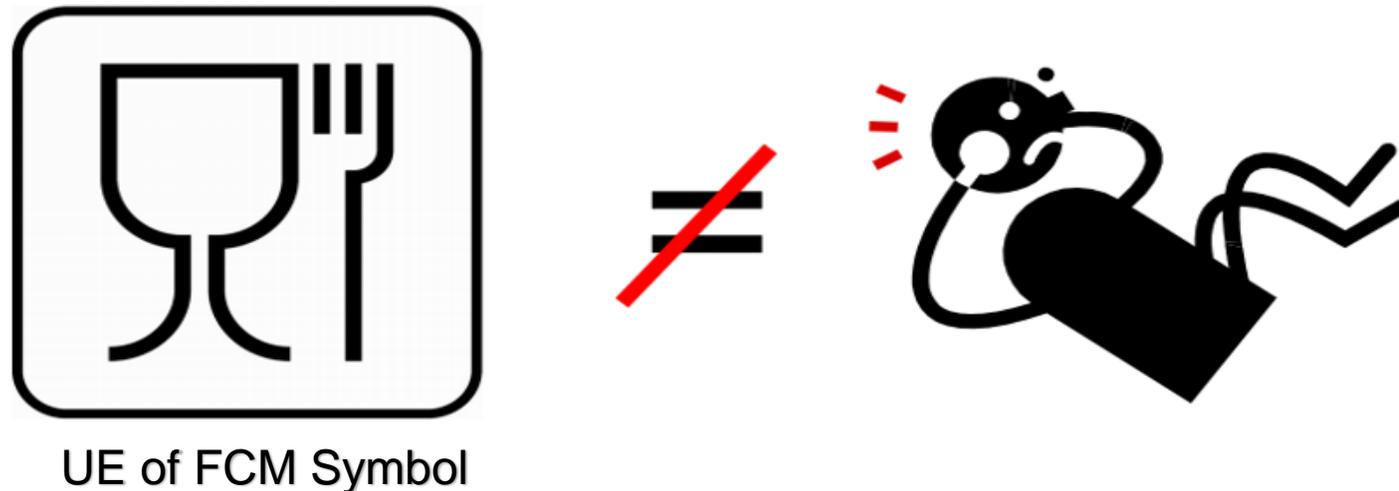


Fig 1. By:  
Dr Rhodri Evans  
EU Regulations on Food Contact  
Materials

# Functions of food packaging

- 1. Isolation and protection of the food against the environment - Isolation** from the environment concerns the protection of food against external factors and the obtaining of food in a form suitable for transport, and the **protection** refers to the preservation of the food so as to prevent significant deterioration of quality
  - **Barrier quality** - The food packaging must act as a barrier, stopping or diminishing the penetration of light, temperature or other physical agents (eg O<sub>2</sub>, water vapor, NH<sub>3</sub>, SO<sub>2</sub>, CO<sub>2</sub>) which could lead to the deterioration of the qualitative qualities of the products can also refer to the gas transfer from the inside to the preservation of the flavor of the food or to avoid its dehydration, the loss of the gases introduced into the package for the preservation of the products, etc.
  - Active and intelligent packaging - Today, different types of active substances can be incorporated into the packaging material to improve its functionality and give it new or additional features:
  - Controlled atmosphere, with less oxygen and more carbon dioxide, results in slowing effects of enzymes in the system
  - Smart packaging with antimicrobial support. Additional functions, oxygen absorption (absorbs O<sub>2</sub> in the pack and prevents cling), antimicrobial activity, moisture absorption, ethylene elimination, and ethanol emissions.
  - Aseptic packaging can be defined as filling a commercial sterile food in sterile containers under aseptic conditions and hermetically closing the containers so that re-infection is prevented. Among the first applications of aseptic packaging are milk and dairy products, fruit and vegetable juices, compote products, soups, puddings, desserts, etc.

# Functions of food packaging II

- ❑ **Migration** - Transfer of packaging material components to food, inconvenient, first of all, the use of plastics as packaging material.
  - ❑ Plastics. Migration factors:
    - All polymers contain small amounts of residual monomers left unchanged by the polymerization reaction. These constituents are potentially available to migrate into food,
    - The contact surface between food and packaging also has a direct influence,
    - The time period for which food and packaging are in contact,
    - The quantity of the constituent in the food at the equilibrium point depends on the physical affinity of the constituent for packaging and food; For example, the degree of migration of a hydrophobic monomer, such as styrene, is partly dependent on the fat content of the food,
    - Typographic inks can pose a threat to product safety and quality.
  - ❑ Paper and cardboard - Chlorophenols may be responsible for the deterioration of antiseptic qualities.
  - ❑ Wood used in pallet construction should be devoid of biocide treatment
  - ❑ Canned cans - The danger of migration arises from indoor coating films such as, for example, epoxy resins. Also, during the sterilization process, migration of bisphenols from the food packaging can be faster and more intense.

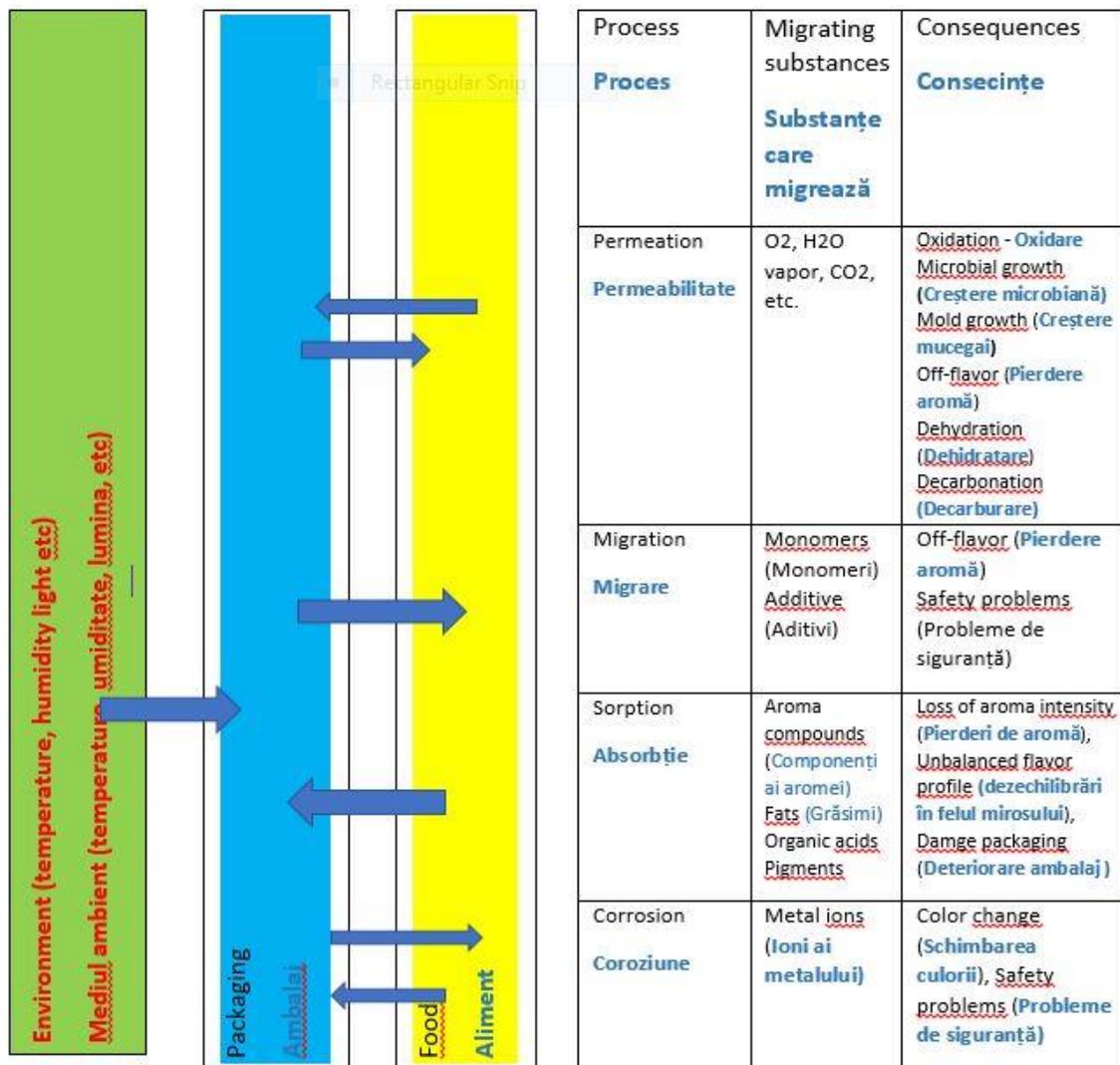
## 2. Product presentation and packaging usefulness

- ❑ Food packaging labels must provide all the information necessary for the purchaser to focus on purchasing the product, the composition of the food, the shelf life, instructions for use and the brand
- ❑ A Universal Product Code (UPC) that can be read accurately and quickly using modern scanning equipment at retail outlets, ingredient and nutritional information (including E-numbers for additives) and country of origin.
- ❑ The shelf life was first defined in Regulation (EC) No. No 2073/2005, as follows: "" shelf-life 'means either the period corresponding to the end-of-life or the minimum durability date as defined in Articles 9 and 10 of Directive 2000/13 / EC

## 3. Protect and ensure the warranty period during storage

- ❑ Packaging must withstand vehicle vibrations, compressive loads during storage in stacks and sudden unloading / loading
- ❑ The protective packaging is generally used for exterior containers used for the transport of goods from the manufacturer to the point of sale and for filler materials inside the outer containers, for example, bubble nylon barrier, urethane foam, "pillows "of polyethylene foam (PE) and expanded polystyrene (PS) packaging
- ❑ The Time-Temperature Indicator (TTI) indicators are used to monitor product quality during transport or storage. This indicator helps to ensure proper handling and provides a benchmark for product quality.

# Medium - packaging - food interaction



Process	Migrating substances	Consequences
Proces	Substanțe care migrează	Consecințe
Permeation <b>Permeabilitate</b>	O <sub>2</sub> , H <sub>2</sub> O vapor, CO <sub>2</sub> , etc.	Oxidation - Oxidare Microbial growth (Creștere microbiană) Mold growth (Creștere mucegal) Off-flavor (Pierdere aromă) Dehydration (Dehidratare) Decarbonation (Decarburare)
Migration <b>Migrare</b>	Monomers (Monomeri) Additive (Aditivi)	Off-flavor (Pierdere aromă) Safety problems (Probleme de siguranță)
Sorption <b>Absorbție</b>	Aroma compounds (Componenti ai aromei) Fats (Grăsimi) Organic acids Pigments	Loss of aroma intensity (Pierderi de aromă), Unbalanced flavor profile (dezechilibrări în felul mirosului), Damage packaging (Deteriorare ambalaj)
Corrosion <b>Coroziune</b>	Metal ions (Ioni ai metalului)	Color change (Schimbarea culorii), Safety problems (Probleme de siguranță)

In Figure 1 are presented the other processes that can occur in the environment-packaging-food interaction

(A complete scenario of product–package interaction resulted from several modes)  
Conform: Handbook of Food Preservation, Second Edition, edited by M. Shafiur Rahman, CRC Press Taylor & Francis Group – 2007

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Thank you!