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PACKAGING AND VIABILITY OF FOOD PRODUCT

Snezana Trmcic¹, Jasna Gvozdenovic², Radomir Jovanović³

Abstract

Packaging is the holder and makes it all that into what the product is put. During its preparation in use are different materials: glass, paper, wood, plastic, metal, ceramic. In packaging design involved experts from different fields-technologists, economists, marketing experts, designers, psychologists etc. Functional suitable packaging is becoming an effective mediator between producers and customer: functions of packaging are different, the most important are following: protection and sustainability of food products, transportation products, easier usability of products, economy, identification and information, motivation, shopping, helping form a good image of the product and recycling after use and conservation of natural habitat. Image product is the overall impression that the product creates a potential customer and includes values, attitudes, and stereotypes about him. Image is not static assumption, but is a process that moves from initial phase of the image-formation and its relative stability. However large number of producers, competitors, particularly large number of similar products developed markets requires a good familiarity with distinction, which is achieved by image producers, or its products. Aim of this work of implementing packaging materials and choice, producers of food products around appropriate packaging and requirements in order to successfully meet demands of sustainability of packed food quality products that they face a modern consumer society.

Key words: packaging, viability of food product

Introduction

World market has great interest in new kinds of food products that rely on various types and forms of packaging, combinations packaging materials and processes

1 Snežana Trmčić, Phd, Assistant Professor, Scientific associate, snezanatrmcic@gmail.com, phone: 063-8362490, Faculty for Management of Small and Medium-sized Companies, Belgrade, www.fimmsp.edu.rs

2 Jasna Gvozdenović, Phd, Associate professor, Cara Lazara 1, Faculty of Tehnology, Novi Sad

3 Radomir Jovanović, M.A., Faculty of Agriculture Belgrade, Serbia

packaging. Food products are highly sensitive to biochemical changes that may occur in technological process (effect of temperature and oxygen content on oxidation changes) as well as during storage of packed product. Develop way of packaging materials and packaging, and packing process are very long. Goal was always same, that for a long time maintain quality of food product.

The development of packaging materials and packaging systems depends on: increase in number, population, economic strength of customers, changes in living conditions and habits of people and technological development of packaging machines.

Until industrial revolution in nineteenth century most of products for human consumption is consumed in production area. Rarely happened that product prepared from worn inner regions of basic raw materials. Customer - consumer brought himself packaging in which buying and wearing products purchased. This type of packaging is marked as *issued packaging* and was a first-generation packaging.

In second half of nineteenth century, population is economically strengthened, trade expanded and developed. Progress in transportation, industrialization, production of larger series, it has developed by use of returnable packaging. Returnable packaging is second generation. Second-generation packaging accompanied cheap labor that covered costs of collection, selection, washing and re-control and other activities necessary prior to its reuse. After World War II, under pressure from food industry, trade is a strong industrialization of the food distribution and other products for human use. During this period create a phenomenon of supermarket. In supermarkets packaging becomes intermediary between producer and buyer. Their shape, appearance, way of opening messages and education materials she assumes role of professional seller in supermarkets. Because of difficulties in organizing preparation, storage and shipment of returnable packaging, supermarkets are pressured to get rid of return. Self-service requirements are clear and asked for use of non-returnable packaging.

- This *irreversible packaging* belongs to third generation. Irreversible packaging become a valuable raw material if it is very well organized, thought out price policy and fostering the habit of collecting, sorting and direct processing. Development of *plastic packaging* has brought a major shift in the packaging industry.
- A new generation of packaging materials emerged in twentieth century, when the man rose to level that can produce such materials do not exist in nature.
- Plastic is youngest bulk packaging material that man began to use industrial. Basis for plastics is petroleum. If we look at structure of consumption of oil as a natural material, of total world consumption of oil, 5% is spent on chemical and petrochemical industries. Today, getting new and improved types of existing packaging materials with better utility value and improved performance.
- Using optimal benefits of aluminum foil, paper, cardboard and plastics, today is developing a new type of packaging so. *Combined package* that starts successfully compete with standard packaging of mono-material.
- A good part of packaging materials, if not collected, pollute environment, giving it the fourth generation of packaging known as *self-destroys, biodegradable*

packaging, which is composed of ingredients that enable a faster degradation of packaging materials and thus is environmentally justified.

- Recently developed food packaging in *edible packaging*, which consists of materials based on saccharin, protein and pectin.
- This type of packaging belongs to fifth generation of packaging.

Latest developments on market in the packing process and sustainability of food products are *active and intelligent packaging* that belongs to sixth, next-generation packaging.

- **Active packaging**, means that components of packaging materials interact with atmosphere above the packed product, quality and extending shelf life of products.
- **Intelligent packaging**, communicating with customers, monitor and signal condition of packaged food in order to obtain information about the quality of food during transport and storage (signaled a change in temperature, pH, color, etc.).

Sustainability of food products

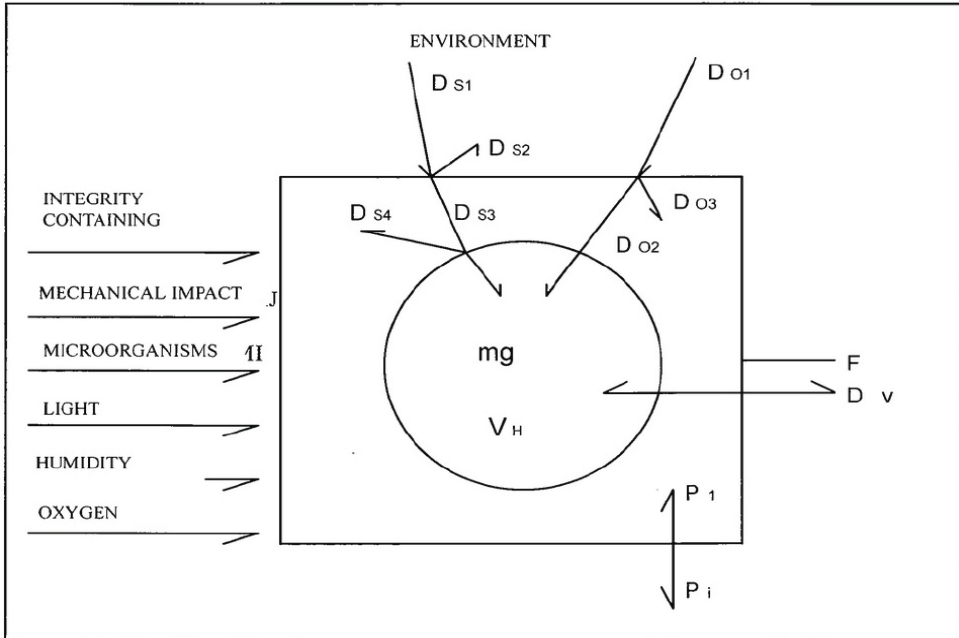
Food products by their chemical composition is very sensitive to biochemical changes that may occur in the technological process (effect of temperature and oxygen content on the oxidation changes), as well as during storage of packed products. During storage of packed content, according to the applied packaging may be a change in water content, values and biochemical changes caused photo-oxidative influence. In addition to protecting integrity of content, packaging must protect packaged product from mechanical impact, impact of micro-organisms, light, molecules of oxygen and moisture.

Packaged products are subject to influence of light, molecules of oxygen and water vapor, intensity and speed of diffusion barrier properties depend on types and combinations.

Metal packaging for a stable crystal structure of materials and packaging pressurization system is a good protection to packed product. This types of packaging in addition to protecting integrity of content, protects the packaged product from mechanical impact, the impact of micro-organisms, light is impermeable to molecules of oxygen and moisture. Proper conduct of technological production process you can get a quality product. Due to characteristics of materials, metal containers must be well protected on inside of product, so to prevent interaction between products and materials from which packaging is made. In *glass packaging*, glass as a material has a crystalline structure with a wider range of amorphous structure so that characteristics of this type of packaging transparency or transmittance of light. Products packed in glass packaging are protected from mechanical impact, influence of microorganisms, and permeability of molecules of oxygen and moisture. Light transmittance is reduced staining glass batch (green, brown). If properly carried out sealing lid-jar, the packaging protects the packaged product from reinfection by microorganisms.(1)

All *polymer packaging materials* in more or less light transmission, molecules of gases and water vapor, so that these characteristics influence their use for packaging of certain food products.

Picture 1 - Barrier properties of polymer packaging



- F - total active surface of packaging unit
- DV - diffusion of water vapor molecules
- mg - critical limit of tolerance products at O_2
- $DO1 - 3$ - diffusion of oxygen molecules
- VH - volume of voids product
- $P1$ - partial pressure in packaging unit
- $DS 1 - 4$ - diffusion of light
- Pi - partial pressure of environment

Diffusion of water vapor molecules is simpler and depends directly upon water content in product. According to presented model, oxygen that diffuses through packaging speed v_1 accumulates in space above contents of containers (v_3) and spent on adsorption in content (v_2). In this diffusion depends on total area of packaging material through which oxygen diffuses (F_1), partial pressure of oxygen within packaging (p_1), cavity volume content (VH) and critical limits of packaged products tolerance for oxygen (mg).^(2,3) To reduce concentration of oxygen molecules, packing is done before de-aeration products or closure under vacuum (drawing air from the packaging). In order to prevent subsequent access to oxygen from surrounding environment in a packaging unit or loss of protective gas from packaging unit, choose packaging materials and containers tightly to oxygen and other gases. Reducing partial pressure of oxygen within the packaging is achieved by using protective modified atmosphere, i.e., packaging products under nitrogen, carbon dioxide or an appropriate mixture of these gases. In case of packages under pressure of nitrogen, oxygen diffusion from external environment occurs only when equalized partial pressure on outer and inner

packaging. Decline of internal pressure loaded gas occurs due to permeability of packaging materials. Formation quality packaging unit means that all connections to primary container tightly closed. At the same time must not remain open or pores that allow free exchange of undefined atmosphere over content of the external environment on molecules of gases or poor hermetic packaging units.

Influence of humidity on changes on packaged products quality

Shelf life of packaged products depends on its hydrate condition. Measure of hygroscopic products, or its capacity of receiving water, depends on affinity of water hygroscopic ingredients in packaged products. Changes in texture, color, taste and smell, packaged food products depend on aw values and the active surface area product and critical levels of tolerance change quality of products based on sorption isotherms.(5,6)

Increased moisture content and aw value changes during storage depend on permeability barrier properties of water molecules packaging materials used.

Importance of proper formation and packaging closure

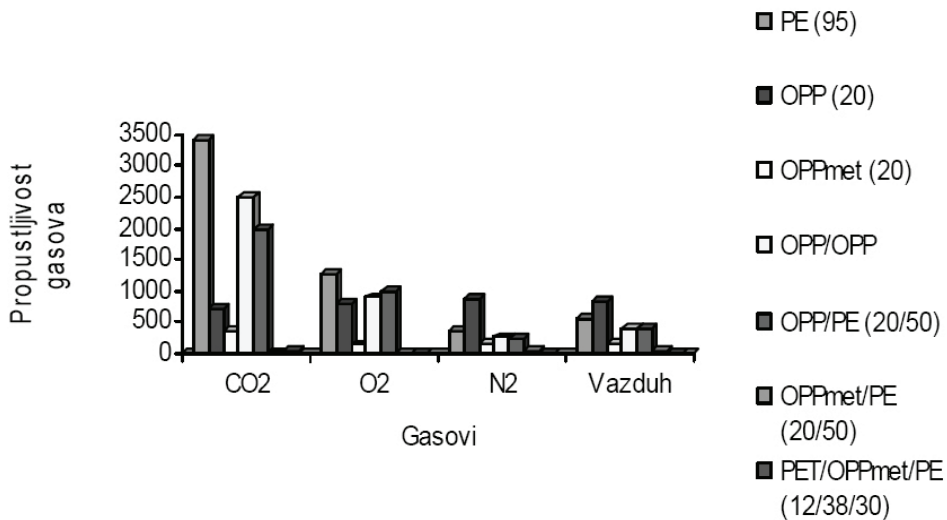
One of factors that affect quality of packed product and its sustainability is properly used and well established packaging. Due to poor pressurization system, within packaging can come to increased diffusion of oxygen molecules, caused by difference in partial pressure on outer and inner packaging.

Barrier properties of polymeric packaging materials

Packaging polymer molecule gases miss depending on type of material and difference of partial pressure. And packaging unit is poorly formed will be increased in diffusion of molecules of gases and water vapor. To achieve optimal characteristics of safety is used combined packaging. For extremely sensitive products combined use aluminum foil as a metal that is sealed to electromagnetic radiation, molecules of gases and water vapor. Thickness of aluminum layer is 7 μm or greater. It is thus obtained by combined packaging materials impermeable to light and virtually impermeable to gas molecules and water vapor. In order to improve barrier properties of polymer films can apply a thin layer of aluminum (and other metals) metallization process.(3,4)

This improves barrier properties of films in metalize electromagnetic radiation (90%), and molecules of gases and water vapor. Degree of barrier properties improvement caused by mass (thickness) of deposited metal and distribution on surface of polymer film.

Figure 1. Gas permeability with various combinations of packaging materials



Conclusion

To maintain and extend optimum processing quality of food product, it is necessary to provide exactly defined quality packaging, which will allow you to maintain quality of packaged product as long as possible and extend to moment of use by using appropriate protective atmosphere.

- Packaging and sealing its barrier properties must be defined to provide adequate protection for nutritional value and high quality media yet shelf.
- In order to achieve these requirements, type and sensitivity of product should be applied to optimal type and combination of packaging materials and sustainable use of extended application of the appropriate protective modified atmosphere, especially due to big number of similar products and because of big number of competitors in producing, because developed markets demand recognition of their goods.

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