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Editorial

Active Packaging for Food Applications

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Active packaging is defined as ''packaging in which subsidiary constituents have been deliberately included in or on either the packaging material or the package headspace to enhance the performance of the package system'' [1]. Active food packaging may include oxygen scavengers, moisture absorbers, ultraviolet barriers, or compounds that deliver flavoring, antioxidant, or antimicrobial agents [2]. The European Regulations 1935/2004 and 450/2009, set standards and requirements for material and articles for applications of active and smart packaging [3,4].

Active packaging interacts with the food and the interior environment the packaging in order to maintain or improve the quality and/or security thereof, or to extend the time of food life. Technology allows to reduce preservatives/additives (cleaner label), the extension life, increase safety and preserving the original quality of food, reduce losses due to spoilage and the potential for diversification of the products. Active packaging technologies may include mechanisms adsorption (binding) curing agents, division or gradual release/diffusion ripening agents, maintenance (for reduce spoilage) and maintaining and/or improving organoleptic characteristics inside the package. These can be, oxygen scavengers (oxygen scavengers), absorption or release of carbon dioxide (carbon dioxide absorbers and emitters), check ethylene, controlling humidity, mechanisms removal or adsorption of odors and flavors liberation antioxidants, systems that improve mechanical or macroscopic characteristics (eg color, condensation) of packaged food and antimicrobial packaging. The Table 1 summarizes examples of active packaging applications for use within the food industry [5].

Absorbing/scavenging properties	Oxygen, carbon dioxide, moisture, ethylene, flavours, taints, UV light
Releasing/emitting properties	Ethanol, carbon dioxide, antioxidants, preservatives, sulphur dioxide, flavours
Removing properties	Catalysing food component removal: lactose, cholesterol
Temperature control	Insulating materials, self-heating and self-cooling packaging, temperature-sensitive packaging
Microbial and quality control	UV and surface-treated packaging materials

***Table 1:** Examples of active packaging applications for use within the food industry.*

The growing consumer reluctance to use chemical conservatives, many of which are suspected carcinogens or residual toxicity, results in increased pressure for adoption more "natural" alternatives to maintain or increase the self-life of foods. These include the use of natural antimicrobials, such as plant extracts and essential oils from plants, as alternative preservatives against chemical additives, but without they come in direct contact with the food, thereby minimizing organoleptic deterioration of the food. Particular interest presents the incorporation of antimicrobial agents packing in edible films (biopolymers), gelatin, casein and other proteins. The active packaging components have a plastic edible or non-materials placed inside the main pack, either in direct contact or not with the foodstuff. The development and implementation of operational modes of incorporation of bioactive ingredients in food, can minimize the organoleptic degradation product of the strong smell of essential oils and simultaneously to limit as much as possible their direct contact with food.

The active packaging area gathers the intense interest of the research world and the food industry internationally, as it can provide significant added value to the food. The correct use of one or more types of active packaging will increase the shelf-life of foodstuffs and high quality and food safety. However, the development and implementation of this type of packaging will depend on the acceptance of consumers and the potential financial benefits and cost effectiveness for food industry.

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