Biodegradable active packaging for food products

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Overview

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2. Biopolymers – Using renewable resources

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Food Packaging and Its Environmental Impact

- **Advances in food processing** and **packaging** play a primary role in **keeping environment safe and clean**.

- The principal roles of **food packaging** are to **protect food products** from outside influences and distribution damage, to contain the food, and to provide consumers with ingredient and nutrition information.

- Materials that have traditionally been used in food packaging include **glass**, **metals**, **paper, paperboards**, and **plastics**.

Food Packaging and Its Environmental Impact

- **The huge development of conventional plastics** made from petroleum-based synthetic polymers **unable to degrade** in landfill or compost-like environment **had led to serious environmental issues**.

- In response to this increasing awareness, the use of **polymers made from renewable and sustainable resources** to develop biopolymers constitutes an innovative and **promising alternative to reduce greenhouse gas and toxic emissions**.

- **Natural polymers** derived from **agricultural products** (such as starch, proteins, cellulose and plant oils) are the major resource for developing renewable and biodegradable polymer materials

Biopolymers – Using renewable resources

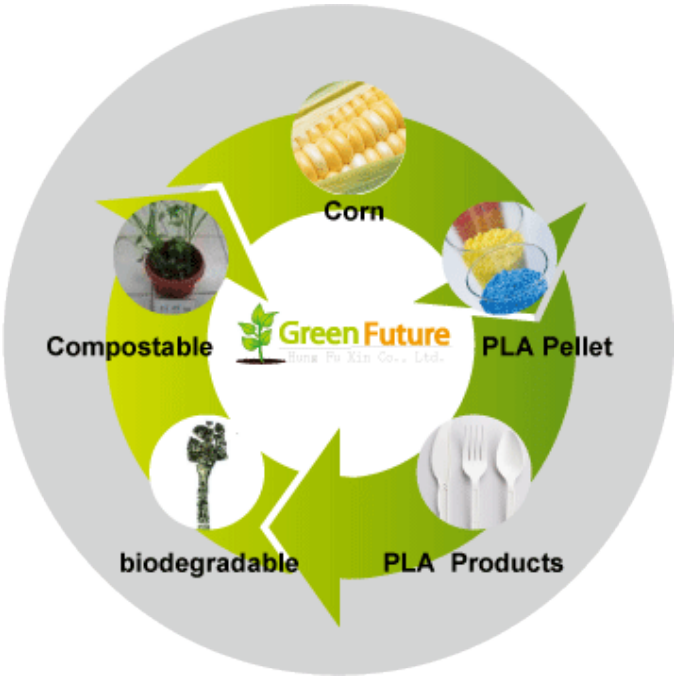
- **The most common biopolymers** are **starch**, **cellulose**, gelatin, **chitosan**, **PLA**, **PHB**, etc.

- **One major advantage** of **biopolymers** is that they are **fully capable of biodegradation** at accelerated rates, breaking down cleanly **into simple molecules found in the environment**, such as CO2, water or methane, **under the enzymatic action of microorganisms**.

Applications of biopolymers in food industry

- **Ideal packaging materials** produced from renewable biological resources, generally known as biopolymers, **have excellent mechanical properties and are biodegradable**.

- The **polylactic acid** (**PLA**) and the **polyhydroxybutyrate acid** (**PHB**) are two of the biopolymers targeted for use in the food industry as food packaging. Both biopolymers have excellent physical properties and are completely biodegradable in a variety of environments.



What is active packaging

- **Active packaging** is accurately defined as "**packaging which subsidiary constitutes have been deliberately included in or on wither the packaging material or the package headspace to enhance the performance of the package system**"

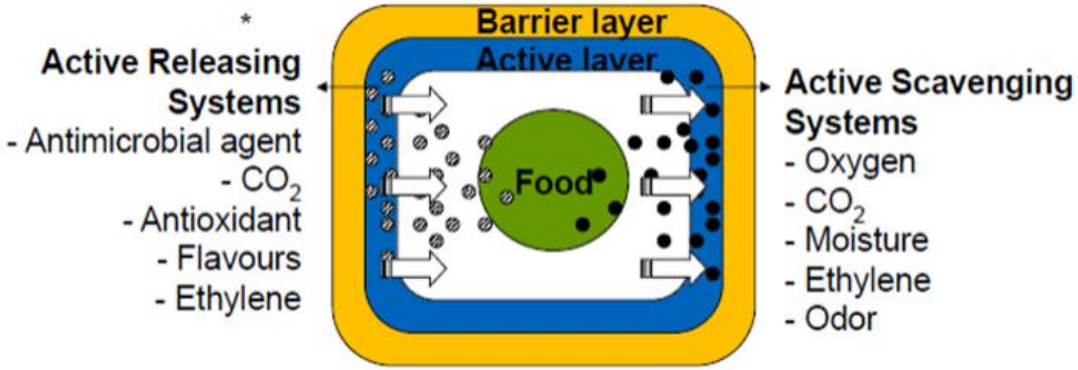
- **Active packaging** is typically found in two types of systems: **sachets** and **pads** which are placed inside of packages, and **active ingredients that are incorporated** directly into packaging materials.

Biodegradable active packaging

- **Antimicrobial packaging** is one of the application of active packaging.

- **It prevents surface growth of different pathogenic microorganisms** where spoilage or contamination occurs.

- **It allows a constant release of antimicrobial agents** in the **food packaging** during storage and distribution.

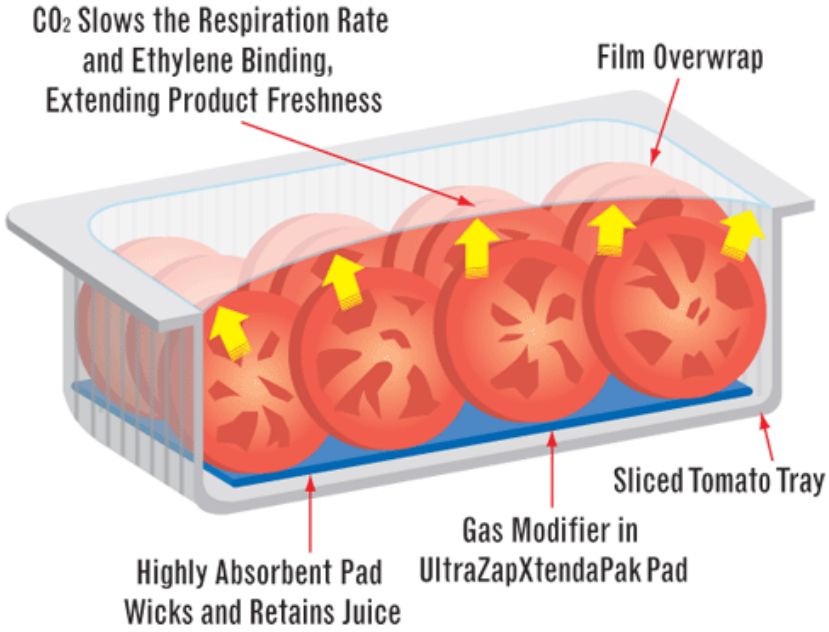


Benefits of active packaging

- **Fresh products are "active" even after harvesting**.

- **Oxygen presence permits the food product to reach the spoilage stage faster.**

- **Reducing the breath rate** of the food product by using **active packaging is a very good method of extending the produce's shelf life**.



Active Packaging: Sachets and Pads

- **Sachets** and **pads** are widely **used to absorb or emit gases** into a package.

- **Oxygen absorbers sachets** are commonly found in **meat** and **poultry products**, **coffee**, **backed goods** and **fried foods**.

- They **cannot** be used in liquid foods.

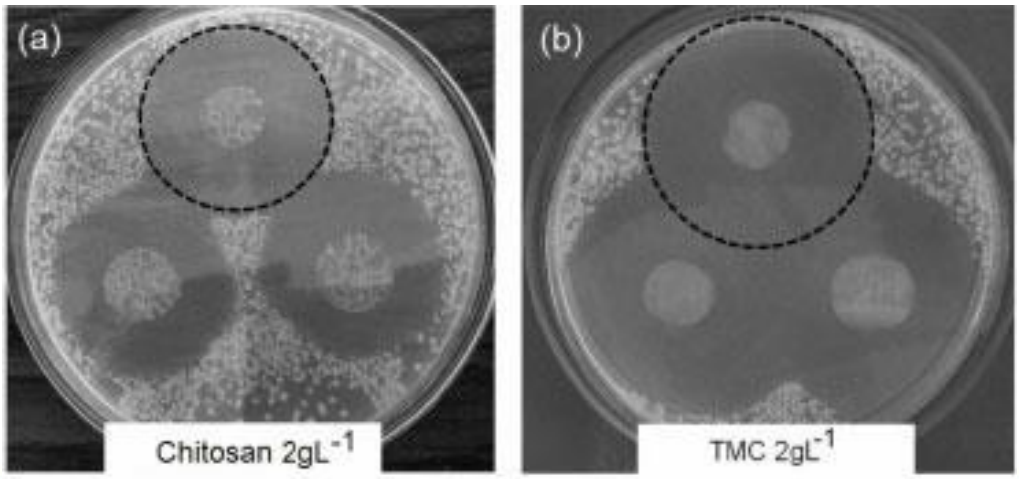
Biodegradable Active Packaging: Antimicrobial Systems

➢ **Antimicrobial food-packaging systems** are polymeric materials in which a certain amount of **additives with pronounced antimicrobial properties** are embedded into the packaging plastic container (rigid or flexible) and act with the aim of **extending food shelf life**.

➢ For this reason, there is an **urgent need to study and to develop renewable source-based biopolymers** able to degrade via a natural composting process.

Biodegradable Active Packaging: Antimicrobial Systems

➢ **In the field of food packaging**, antimicrobial biodegradable films are generally obtained by **using the solvent casting technique**: **a chitosan-loaded PLA film having high inhibitory properties against mycotoxinogen fungal strains**.



Using essential oils in active packaging

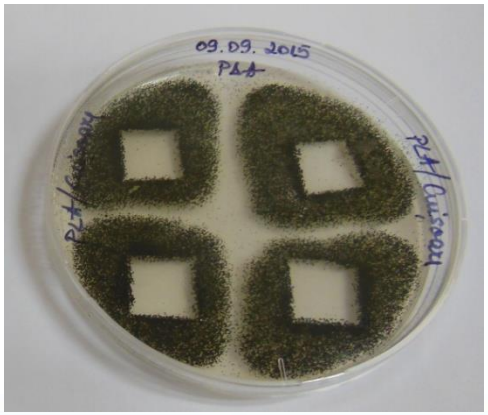
➢ **Essential oils** are now **being used as additives in biodegradable films and coatings** for active food packaging.

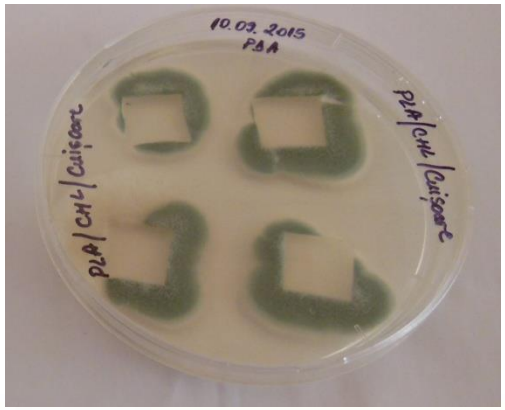
➢ **Essential oils** represent an **interesting ingredient** for biodegradable food packaging, mainly due to their natural origin and their functional (**antioxidant** and **antimicrobial**) properties.

Active packaging – essential oils results

- During my Ph.D. I conducted studies in the Food Safety laboratories of the Faculty of Biotechnology, on the **antimicrobial effect tests of some essential oils over three types of fungi**: ***Aspergillus brasiliensis***, ***Penicillium corylophilum*** and ***Fusarium graminearum***.

- The **essential oil (in this case clove) was incorporated in the PLA films** and the **antimicrobial activity was observed over a 7 days** period.





Conclusions and consumer acceptability

- **Biodegradable packaging development is just beginning**; until now **it cover approximately 5 to 10% of the current packaging materials market**, about 50,000 t in Europe.

- **Their development costs are high** and yet they do not have the benefit of economic scale.

- It seems very unlikely that biodegradable oil based polymers will be displaced from their current role in packaging application, where cost is more important for the consumer market than environmental acceptability

Conclusions and consumer acceptability

- **Antimicrobial packaging is an extremely challenging technology** that could **extend shelf-life** and **improve quality and safety** of food products.

- **The concept of a progressive release of antimicrobial compounds to the food products** appeared very relevant to preserve food from fungal contamination because moulds are usually developing at the surface of the products.


100 %
BIODEGRADABLE
RECYCLABLE
TESCO
healthyliving
Fresh British
Diced pork
No Carbs
THINFILM
Sensor Tag
ripeSense
smartfood


рахмат
danke
謝謝
ngiyabonga
teşekkür ederim
Баярлалаа
спасибо
faafetai lava
mersi
barka
welalin
tack
spas
dank je
misaotra
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tapadh leat
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감사합니다
merci