

Essential oils as possible candidates to be included in Active Packaging Systems and the use of biosensors to monitor the quality of foodstuff

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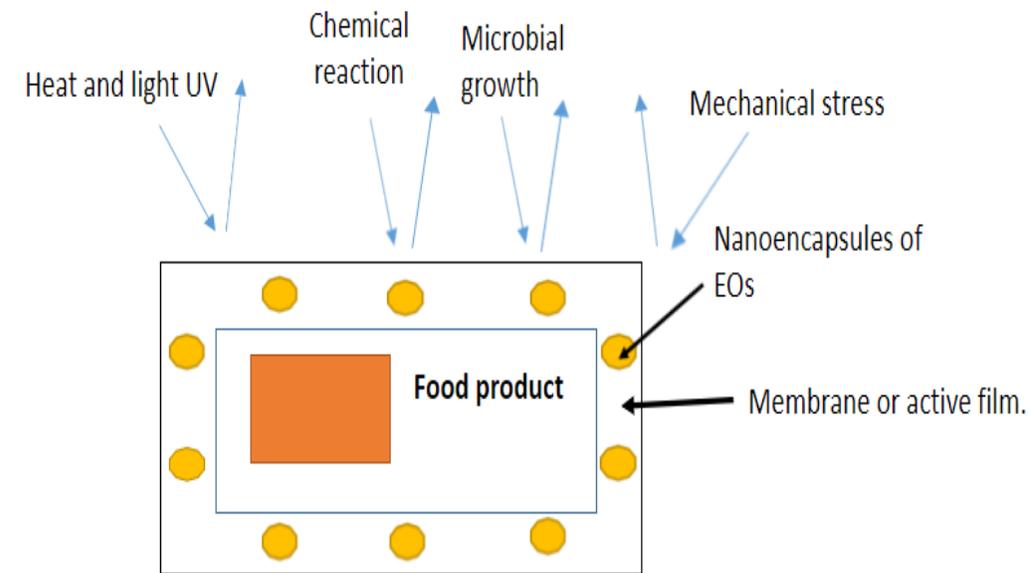
Objectives

1. Essential oils (EOs) as food additive to be incorporated in active packaging (AP).
2. Could nanoencapsulation of EOs be a suitable technique to overcome the limitations of EOs?
3. Could biosensors be a new tool to improve even more food quality and safety?



Active packaging: What is it?

- **AP:** there are interactions with the product, producing the absorption or the liberation of components from/to food.
- It has a protective function.
- **EOs:** Bioactive compounds as new additives.
- **New trend:** use of materials of natural origin such as polysaccharides, proteins or lipids.



EOs: Why they are possible candidate as food additive in AP?

- EOs are present in plants.
- EOs are classified as GRAS food additives.
- They contain antioxidant and antimicrobial properties.



Antioxidant activity

- Barrier against the oxidation.

Antimicrobial activity

- Inhibit the growth of pathogens.

EOs	Biological activity
Cinnamon essential oil	Antimicrobial (<i>S. aureus</i> , <i>E. coli</i> , <i>L. monocytogenes</i>); Antioxidant: DPPH 1.5% CEO (64.73%)
<i>Zataria multiflora</i> essential oil	Antioxidant DPPH (97.2%); Antimicrobial (<i>B. cereus</i> , <i>E. coli</i> , <i>P. aeruginosa</i> , <i>E. faecalis</i> , <i>S. aureus</i> , <i>A. flavus</i>).

Drawbacks that EOs present when used as additives

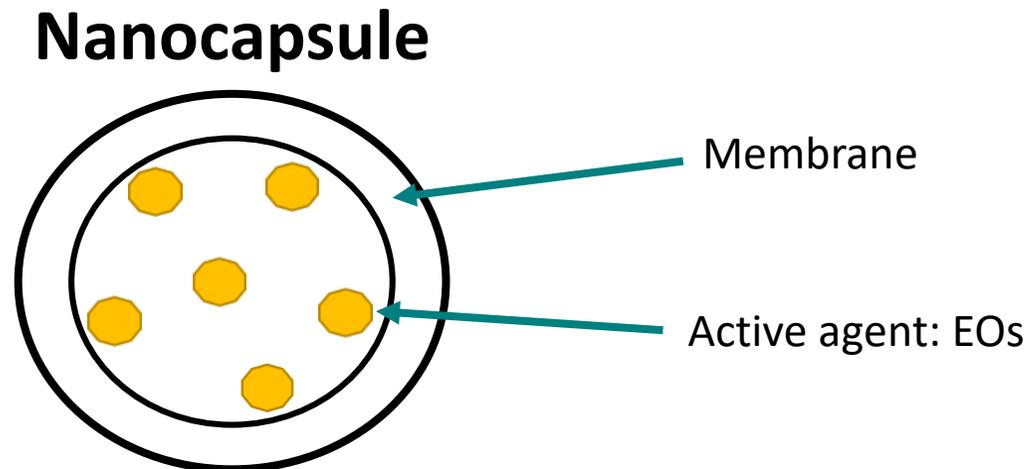
Specific physical modifications in the packaging can lead to a reduction of food product quality such as:

- Low solubility.
- High volatility.
- Strong flavor.
- Sensible to heat and light.
- Some undesirable changes in the organoleptic properties.



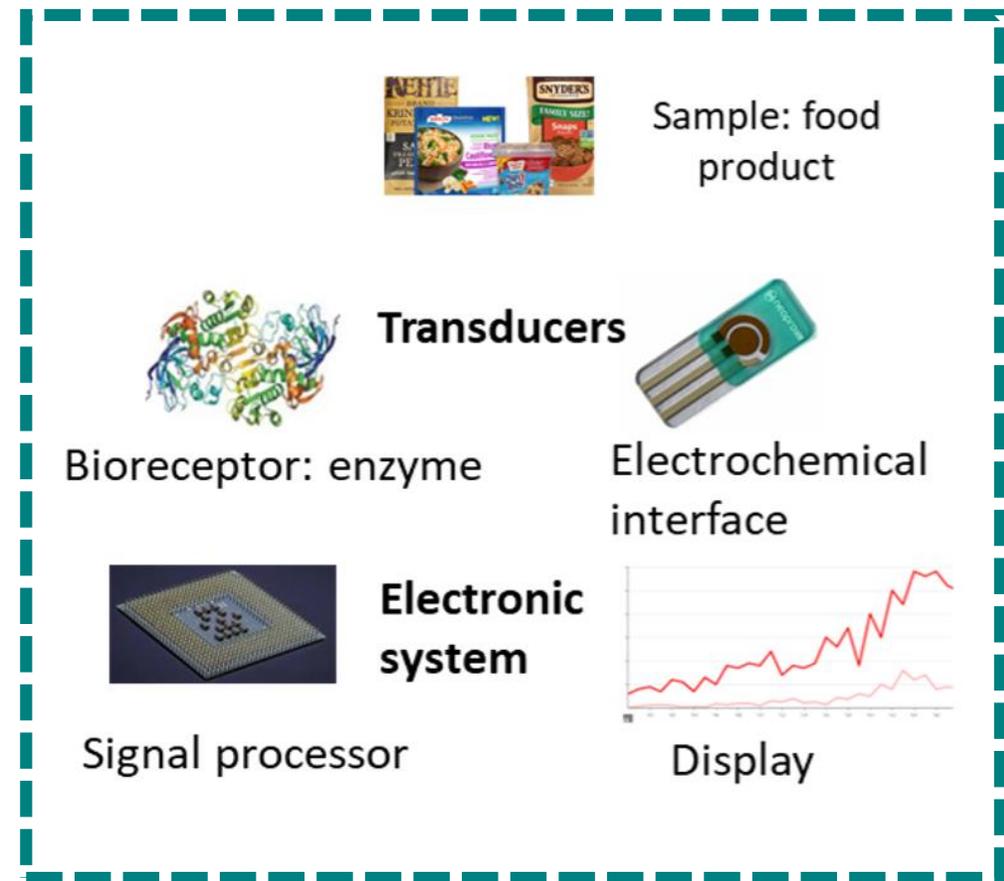
Nanoencapsulation of EOs

- Possible solution to overcome previous limitations of EOs in AP.
- It consists of introducing an active agent (EOs) inside a membrane with a nanocapsule.
- It allows controlled release of EOs from the nanocapsule.
- It can increase the bioavailability of EOs lead to improving of their biological activities of EOs.



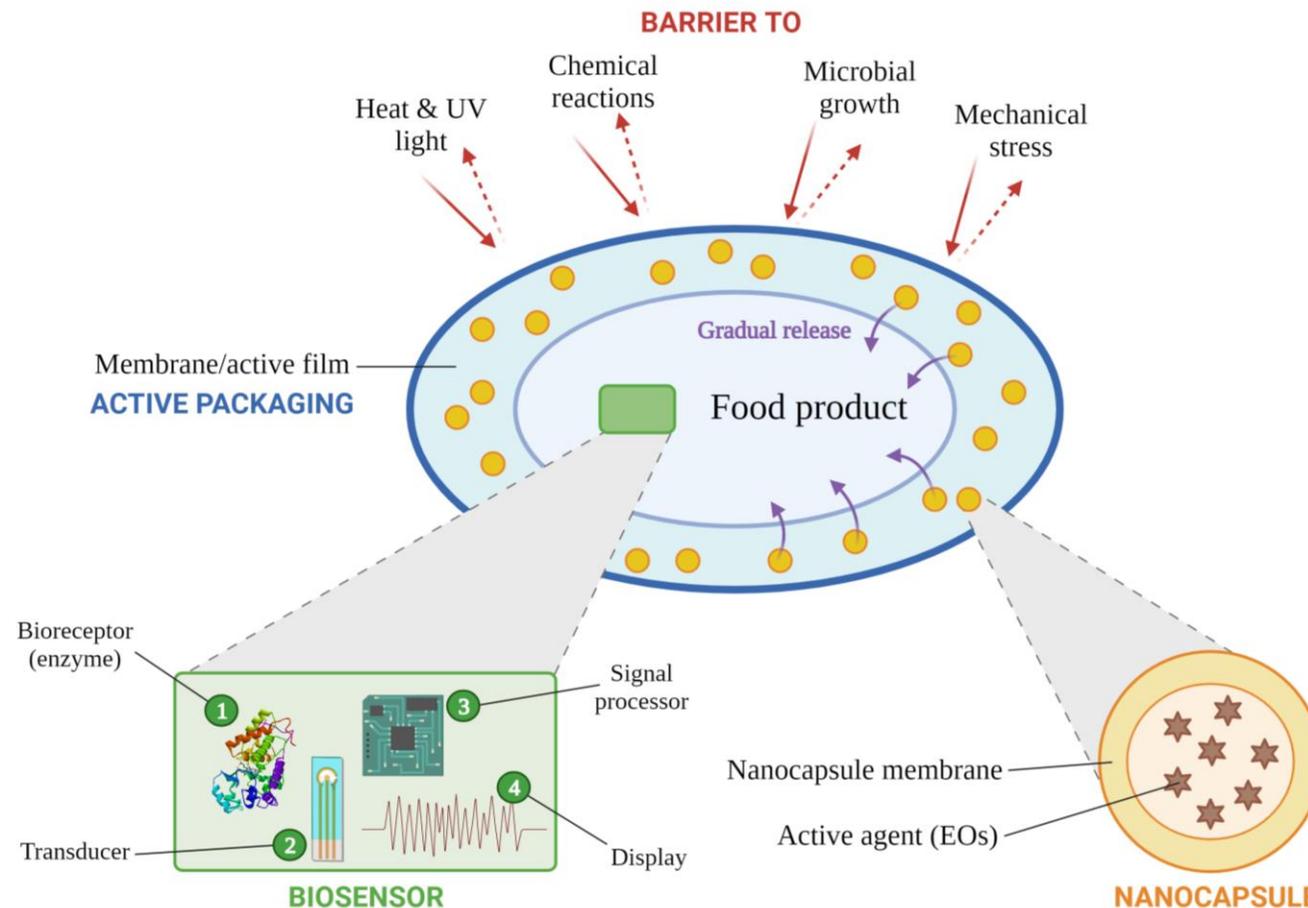
Biosensors: structure and function

- Intellectual property: quickly detection of unpleasant changes in the packaging system.
- They contain: i) a detection system, ii) a signal processing, and iii) an electronic system.
- They are responsible for transforming biological responses in a processed signal, being enzymes, receptor proteins, antibodies and nucleic acids the recognition elements.
- Electrochemical biosensors are the most employed.



Combination of AP + nanoencapsulation of EOs + biosensors

This combination could lead to important improvements in food safety, an extension of products' shelf-life and higher protection against oxidation and food deterioration mediated by the action of microorganisms.



Conclusions

- Major interest in using natural origin food additives such as EOs to replace synthetic chemical additives and use natural origin materials (polysaccharides, proteins or lipids).
- Still are some limitations concerning the use of EOs as active agents.
- Nanoencapsulation of EOs can be a new alternative to overcome these limitations concerning the use of EOs.
- Biosensors could be the most promised technology to quickly detect the unpleasant changes in food products.
- The combination of AP + nanoencapsulation of EOs + biosensors could result in more safety and quality food products.

Thank You For Your Attention!

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