Biodegradable packaging material coated with antimicrobial agent

Antimicrobial biodegradable packaging

Identification

Key words
- Paper, fibrous, substrate, coating, bio-polymer, antimicrobial, volatile agent, essential oil, textile, packaging

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Completed by
- INRA - IATE

How does it work?

Primary objective
- Protect products against the activity or development of microorganisms.

Working principle
- This technology is based on the antimicrobial activity of some essential oils, and the way to implement this property into biodegradable packaging materials. (1) Materials based on a fibrous (woven or non-woven) substrate are coated with a matrix. The coating matrix is made of one or more biodegradable polymers that allow the controlled emission of one or more volatile antimicrobial agents (essential oils or molecules extracted from essential oils). The essential oils or their extracts are released depending on the humidity rate of the inside atmosphere of the package. As a consequence, the package is adaptable to a various range of products and conditions: the higher the humidity rate is, the more microorganisms are likely to proliferate (favourable growth condition), but also the more antimicrobial agents are released, limiting the microorganism growth. (2,3,4,6)

The principle is conversely applicable for a lower humidity rate. (5)

Images

Additional effects
- Some essential oils have an antioxidant activity in addition to their antimicrobial activity.

Important process parameters
- Mainly relative humidity (water is the trigger to antimicrobial agent release)

Important product parameters

What can it be used for?

Products
- Fresh edible products (fruits, mushrooms, vegetables, cheese, composite food, etc.)
- Fresh cut flowers, cosmetics, pharmaceutical products

Operations
- Packaging
Solutions for shortcomings

- Biodegradable product
- Renewable resources
- Antioxidant
- Extended/longer/improved shelf life
- Reduction of salt and sugar content
- Using of environmentally friendly materials
- Higher product safety
- Application of modified atmosphere packaging
- Avoiding additives
- Reducing energy for cooling
- Meat preservation
- Shelf life of pre-baked bread
- Postharvest processing of fruits
- Development of current organic food production techniques
- Biodegradable packages with antioxidant and antimicrobial properties

What can it NOT be used for?

Products: Liquid products
Operations: Any other operation than packaging
Other limitations:
- Some essential oils are under use restriction (particularly cinnamaldehyde from cinnamon) because of their toxicity threshold.
- In the case of gluten based materials, the presence of gluten should be notified for gluten allergic people even if these gluten-based materials are not allergenic at contact and are not supposed to be ingested.

Risks or hazards: Some people might be allergic to one or more essential oils.

Implementation

Maturity: A patent has been registered. Currently it is not exploited. It is only available at labscale while some process steps have been tested at pre-industrial scale.

Modularity/Implementation: The fabrication process replaces a part of production line.

Consumer aspects: No information currently available

Legal aspects: A patent has been registered in 2007 for the french territory (1) Please check local legislation for admitted essential oils thresholds

Environmental aspects: Use of renewable resources
- Biodegradable material

Facilities that might be interesting for you

Further Information

Institutes: UMII - IATE, INRA - GMPA, AgroSup Dijon - PAM, UMII - ATA, University of Zaragoza

Companies: Paper industries (they have all the equipment needed to exploit the mentionned patent)
References


Source: