



Institut "Jožef Stefan", Ljubljana, Slovenija



center za prenos tehnologij in inovacij
na Institutu "Jožef Stefan"

Licensing opportunity

Innovative antimicrobial and antioxidant food packaging films and foils

Field of use

02002002 Coatings
02005001 Foil, films
02005005 Plastic bags

Current state of technology

Stage of Development:
Available for demonstration

Patent status

Patent(s) applied for but
not yet granted

Publication

TBA

Developed by

Jožef Stefan Institute

Reference

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Background

A Slovenian research institute and a university have developed an innovative antioxidant and antimicrobial flexible plastic material for making films and foils to be used in food industry and where food needs to be preserved for a longer period of time with help by temporary solutions. The Slovenian research institute and university are looking for manufacturers of foils and films for license agreements.

Description of the Invention

Due to changes in increased public awareness about environment and health, strict packaging regulations and guidelines, a lot of effort has been put into development of innovative food packaging materials to achieve resistance against pathogens, to reduce unnecessary waste and spoilage, to reduce the use of chemical preservatives and to improve the nutritional and sensorial properties of food. Unfortunately, not many solutions proved to be adequate in terms of costs, environment and health.

Polypropylene and polyethylene commonly used for foils and films show permeability for gases like oxygen, little to no measurable antimicrobial activity and antioxidant activity at around 2 to 4%. As a consequence, these materials are treated with different solutions to enable desired characteristics like antioxidant and antimicrobial activity.

Researchers from a Slovenian institute and university with extensive experience in the field of food science and surface engineering have developed a method and initial design of corresponding apparatus for production of antioxidant and antimicrobial material.

The procedure starts with a substrate, usually made of polymeric materials like polyethylene (PE) or polypropylene (PP). PE or PP foil is treated to saturate the surface with polar functional groups, without changing its other properties. Wettability of the layer is improved at the same time, and that helps with the next step, where the chitosan layer is applied. The role of this layer is to provide a barrier for oxygen diffusion and antibacterial activity. Additionally, it helps the following layer, called active layer, to be adhered firmly and effectively on the previous one.

The third and final layer in general consists of antioxidant material (e.g. pomegranate extract) and chitosan nanoparticles that form a network. The chitosan in the active layer is intentionally used in form of nanoparticles due to particularly enhanced antibacterial properties when



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in this form. Along with the chitosan layers, the active layer also acts as additional oxygen permeation barrier.

Along with the method, adequate apparatus for producing packaging material was designed and it has several treatment units through which the material passes.

The research institute and university are looking for companies and other industrial partners for a license agreement to use this technology. Partners should specialize in production of flexible plastic food packaging materials with emphasis on foils and films. The research institute and university will provide the necessary information and other specifications, required for efficient and proper implementation of the method and apparatus in a production process, while partner will be able to use this technology in their production processes.

Main Advantages

The method for synthesis of films and foils has several advantages compared to untreated materials and other solutions:

- Increased antimicrobial activity (e.g. in tests the bacteria *Staphylococcus aureus* were reduced by more than 90%)
- Increased antioxidant activity by a factor of more than 10
- Reduced oxygen permeability by over 90%

As a result, the food packed in this material can last longer. Beneficial nutritional properties are also kept for a prolonged period of time, while detrimental effects are considerably slowed down.