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CHINA GLOBAL BRI FOOD AND AGRICULTURE DEVELOPMENT AND SERVICE CENTER

中国全球一带一路食品农业开发和服务平台

CONVENIENCE AND PRE PREPARED MEALS

方便食品 + 预 制 餐/菜

1. Minimally processed food - E.G. Fresrh salad vegetables or cut fruits 2.Ready-To-Cook meals
3. Ready-To-Eat meals 4. Pre prepared cooking ingredients

Why CONVENIENCE FOOD AND PRE PREPARED MEALS SO POPULAR WORLD-WIDE AND IN CHINA

Convenience foods and pre-prepared meals are booming in China, projected to exceed 1 trillion RMB by 2026, driven by fast-paced urban lifestyles, the need for time-saving, and rising demand from young consumers.

The pandemic normalized home, school, and workplace consumption, while enhanced technology ensures consistent flavor and higher safety standards than small, traditional eateries.

Key Factors Driving Popularity

Fast-Paced Lifestyle & Convenience: Rapid urbanization means workers have less time to cook, making, heating, or assembling pre-cooked meals a necessary shortcut.

Restaurant/Corporate Adoption: A major driver is restaurants, schools, and corporate cafeterias using pre-prepared food, which offers consistent quality, lower labor costs, and faster service.

Improved Quality & Safety: Modern packaging and flash-freezing technology mean that food is now often perceived as healthier and more reliable than food from small, unhygienic workshops.

Demographic Shifts: Smaller household sizes and a younger generation (starting with the 95s) that cooks less frequently have increased reliance on ready-to-eat meals.

MAIN ISSUES WITH CHINA CONVENIENCE FOOD AND PRE PREPAED MEALS INDUSTRY

Key Problems and Issues:

Food Safety and Quality Scandals: Pre-made dishes and convenience foods have faced significant public backlash regarding quality control, with incidents involving unethical ingredients and low sanitation standards + adulation [artificial preservatives, flavour enhancers and industrial colors]

Lack of Standardized Regulation: The industry suffers from a lack of unified quality standards and traceability, particularly for the fast-growing pre-made dish sector, leading to inconsistencies and trust issues.

High Market Homogenization and Competition: The market is saturated with similar products, leading to intense competition, low profit margins, and a focus on price over quality,

Environmental and Packaging Waste: The rapid growth of takeaway and convenience food has led to a massive increase in plastic pollution, which has risen significantly over the past decade.

Public Health and Nutrition Concerns: Convenience foods often fail to meet nutritional standards, contributing to rising obesity and chronic diseases in China due to high fat, sodium, and energy density compared to traditional diets.

Supply Chain and Production Issues: The industry faces challenges from agricultural supply limitations, including limited arable land and contamination, which affect ingredient sourcing

Lack of Development Planning - 不计划化

MODERN CONVENIENCE FOOD TECHOLOGY AND PRODUCTION CHAIN 现代方便食品技术与产业链

AI ASSISTED PRODUCTION PLANNING

Market and customer survey

Variety selection

Farm site selection and preparation

Farming technology and management

Harvest maturity standard and technology

Pre Cooling technology and equipment

Postharvest technology and quality maintenance

Storage technology and equipment

Transportation technology and cold chain logistics

Value adding and new product development

Dehydrated long storage food

Pre prepared convenience meal/food

Deep value adding EG. nutraceuticals

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水果和蔬菜

谷物和豆类

经济作物

肉类

海鲜

中草药

The principles for all food and agriculture products are the same from farming to postharvest management to processing and product development – BUT vary widely in technology and equipment requirements -从种植、保鲜处理, 加工到产品开发，所有食品和农产品的原则都是相同的 - 但在具体的技术和设备要求方面有很大差异

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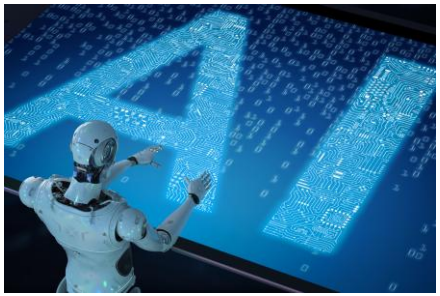
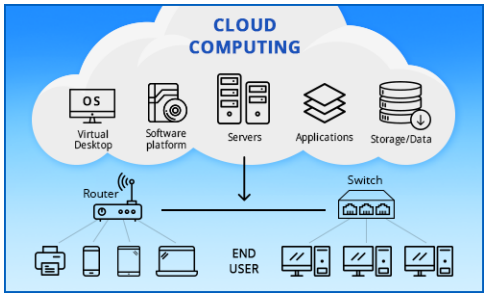
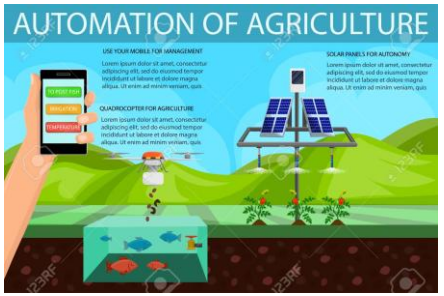
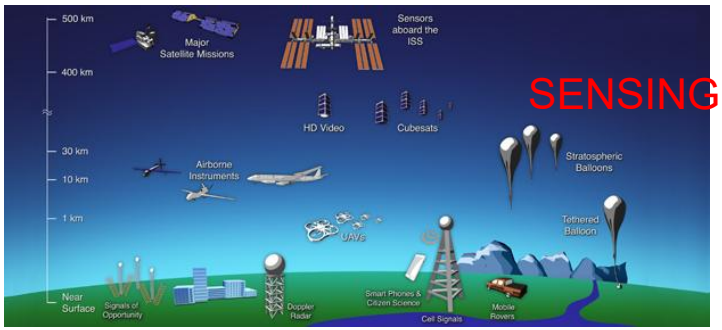
THE FUTURE OF MODERN FARMING – APPLICATION OF EMERGING TECHNOLOGIES

现代农业的未来 -新兴关键技术









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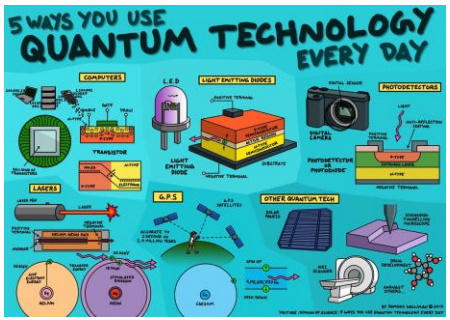
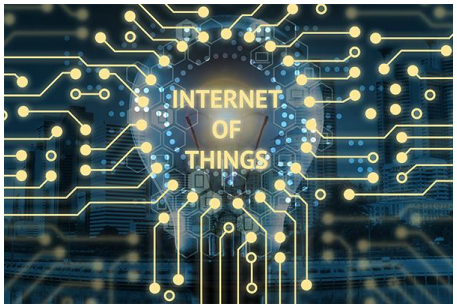




AI 大数据 云计算 超级计算机 遥感和近距离传感技术 量子技术 **IOT** **5/6G** 区块链技术 机器人技术 无人机和无人飞行器

APPLICATION OF AI IN CONVENIENCE FOOD INDUSTRY

AI enhances efficiency, safety, and innovation by optimizing supply chains, reducing waste, and automating quality control.

KEY BENEFITS

Enhanced Quality Control & Food Safety: **AI-powered computer vision systems** inspect products on production lines, detecting defects, contamination, or packaging errors in real-time far faster than human inspectors.

Production & Operational Efficiency: **AI analyzes data from sensors and production lines to optimize** schedules and reduce maintenance downtime. It also optimizes logistical efficiency, reducing vehicle activity and lowering costs.

Waste Reduction & Inventory Optimization: AI analyzes historical sales, weather patterns, and consumer trends to **predict demand accurately, minimizing overstocking and food spoilage**.

Accelerated R&D and Innovation: **AI speeds up product development** by analyzing millions of data points to identify emerging trends, new flavor profiles, and ingredients for personalized nutrition.

Sustainable Agriculture & Supply Chain: **AI enables precision farming** by monitoring soil and nutrient levels, reducing fertilizer/pesticide use, and increasing transparency within the supply chain.

Improved Customer Experience: **AI facilitates personalized meal recommendations, tailored nutritional plans, and faster service in restaurants** via AI-enabled drive-throughs and automated inventory management.

APPLICATION OF ROBOTICS IN CONVENIENCE FOOD INDUSTRY

Robotics in the food industry enhances efficiency, safety, and consistency by automating repetitive tasks like cutting, packaging, and sorting. They reduce labor costs, minimize human contamination, and enable faster production rates. .

KEY BENEFITS

Improved Safety and Hygiene: Robots minimize human contact with food, significantly reducing contamination risks and improving food safety standards. They can operate in extreme temperatures or sanitary environments (e.g., freezing or high-heat) without risk to human health.

Increased Productivity and Speed: Robotic systems operate continuously without fatigue, leading to higher output and faster processing speeds than manual labor.

Enhanced Precision and Quality: Robots provide consistent quality by maintaining precise cutting, portioning, and packing standards, which improves yields and reduces waste.

Labor Efficiency and Cost Savings: Automated systems alleviate labor shortages, enabling companies to manage high-volume, repetitive, or physically demanding work without relying heavily on manual labor.

Flexibility and Customization: Modern robots can be programmed for various tasks—such as decorating, picking, or assembling—and easily adjusted for different recipes or packaging needs.

Improved Traceability: Integrated robotic systems, often with machine vision, allow for better, automated data tracking in production lines, which enhances food quality control and traceability

MODERN CONVENIENCE PACKAGING DESIGN and TECHNOLOGY 现代包装设计与技术

Packaging technology for convenience food focuses on extending shelf life, enhancing ease of use, and ensuring freshness.

- Modified Atmosphere Packaging [MAP]
- Vacuum Skin Packaging
- Smart and Sustainable Materials.
- Edible Films
- Edible Coatings

Key innovations include self-venting steam pouches, resealable films, and active packaging that regulates gas levels or moisture, designed specifically for rapid microwave or oven preparation

MODIFIED ATMOSPHERE PACKAGING [MAP]
气调包装

Key Aspects of Modified Atmosphere Packaging (MAP):
How it Works:

The original air is removed and replaced by a specific, controlled mixture of gases, often involving a process called "gas flushing".

Key Gases Used:

- **Nitrogen:** An inert gas used to displace oxygen and prevent packaging collapse.
- **Carbon Dioxide:** Inhibits the growth of bacteria and mold.
- **Oxygen:** Kept at low levels to reduce oxidation, but sometimes high levels are used to maintain the red color in red meat.

Benefits:

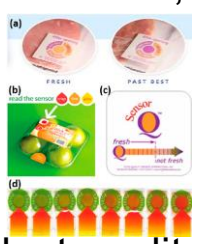
- **Extended Shelf Life:** Products stay fresh for a significantly longer time, allowing for wider distribution and less waste.
- **No Preservatives:** Reduces or eliminates the need for chemical preservatives, appealing to health-conscious consumers.
- **Better Product Presentation:** Prevents oxidation (browning) and keeps products looking appealing on shelves.

Common Applications: Fresh red meat, poultry, seafood, salads, bakery items, cheese, and ready meals.

Components: Requires specialized packaging films with specific, controlled permeability to maintain the gas mixture inside.

SMART/INTELLIGENT PACKAGING [SP]
智能包装

Smart packaging is advanced packaging enhanced with technology - such as QR codes, NFC tags, or sensors - to go beyond traditional protection by providing, storing, or communicating information about the product's condition, authenticity, or usage. It improves supply chain visibility, reduces waste, ensures safety, and boosts consumer engagement.



Key Types and Usage Examples

Intelligent Packaging: Monitors product quality and communicates information. Examples include sensors for freshness in meat/seafood, time-temperature indicators (TTI) for cold chain compliance, and pH indicators

Active Packaging: Interacts with the product to extend shelf life. Examples include oxygen absorbers and moisture controllers

Connected Packaging: Links consumers directly to digital content via NFC tags or QR codes for tracking, authentication, or marketing engagement, such as the

An **NFC tag** is a small, passive, battery-less sticker or card containing a microchip and antenna that stores small amounts of data.

VACUUM SKIN PACKAGING [VSP]
真空贴体包装

Vacuum Skin Packaging (VSP) is an advanced packaging technology that seals products by removing all air and wrapping a specialized top film tightly around the item, acting like a "second skin" onto a tray or backing board. It prevents oxidation and bacteria growth, extending shelf life while ensuring leak-proof, high-visibility, and attractive, space-saving presentation.

Key Benefits of Vacuum Skin Packaging

Extends Shelf Life: By removing oxygen, it inhibits microbial growth and prevents freezer burn, which keeps meat, seafood, and prepared foods fresh for longer periods.
Superior Presentation: The skin-tight seal conforms to the product's shape, preventing juices and sauces from leaking or moving, which makes the product look better on shelves.
Secure & Sustainable: It provides a strong, protective seal for delicate or sharp-edged products (e.g., bone-in meats) while reducing packaging volume and plastic usage compared to conventional MAP (Modified Atmosphere Packaging).
Convenience: Many VSP packages are ovenable and microwavable, allowing for direct cooking.

Common Applications
VSP is widely used for high-value food items:
Fresh Red Meat & Poultry: Maintains color and prevents liquid leakage.
Seafood: Provides a high-oxygen barrier for delicate fish.
Ready Meals: Secure, travel-ready packaging that prevents spills.
Cheese: Prevents moulding by eliminating air.

EDIBLE FILM PACKAGING [EFP]

可食用薄膜包装

Edible films are thin layers of food-grade materials—typically proteins, polysaccharides, or lipids—designed to wrap, coat, or separate food components. They are consumed with the food, providing environmental benefits by reducing plastic waste, while also acting as barriers to moisture, gas, and microbial growth to extend shelf life.



Key Aspects of Edible Films:

Materials: Common ingredients include proteins (casein, gelatin, whey), polysaccharides (starch, pectin, alginate), and lipids (waxes, fats).

Functions: They serve as coatings on fruits and vegetables, wrappers for candy, or pouches for pre-measured ingredients like coffee or soup that dissolve in hot water.

Benefits: These films prevent nutrient loss, enhance flavor and color, improve texture, and can carry active ingredients such as antioxidants or antimicrobials.

Applications: Commonly used on meat products (casein-chitosan films), fruits (wax coatings), and confectionery, often acting as a barrier to oxygen and moisture.

Types of Edible Film Materials:

Polysaccharides: Pectin, alginate, and starch provide good strength but are usually less effective moisture barriers.

Proteins: Casein and whey protein provide excellent oxygen barriers.

Lipids: Waxes (e.g., carnauba) are superior for moisture protection

EDIBLE COATINGS
可食用涂层包装

Edible coatings are thin, natural, and biodegradable layers applied to food surfaces—such as fruits, vegetables, and meats—to extend shelf life, reduce spoilage, and retain moisture. Made from polysaccharides (starch, alginate, chitosan), proteins, or lipids, these coatings create a protective barrier that slows down respiration and moisture loss.

Key Types and Components of Edible Coatings

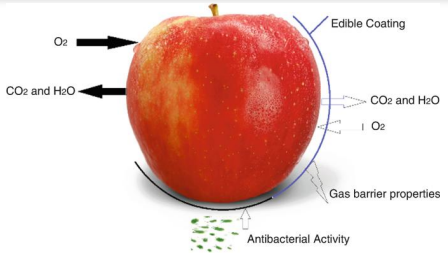
Polysaccharide-based coatings: Include chitosan (antimicrobial), alginate, pectin, and cellulose derivatives. These are excellent at reducing respiration rates and maintaining firmness in fruits.

Protein-based coatings: Include whey protein, casein, soy protein, and zein (from corn). These offer strong oxygen barriers and are often used on meats and dairy products.

Lipid-based coatings: Include carnauba wax, beeswax, oils, and fatty acids. These are highly effective as moisture barriers.

Active coatings: These incorporate antimicrobial or antioxidant agents—such as essential oils (cinnamon, clove), plant extracts, or nano-fillers—to actively fight bacterial growth and extend shelf life.

EDIBLE COATINGS
可食用涂层包装



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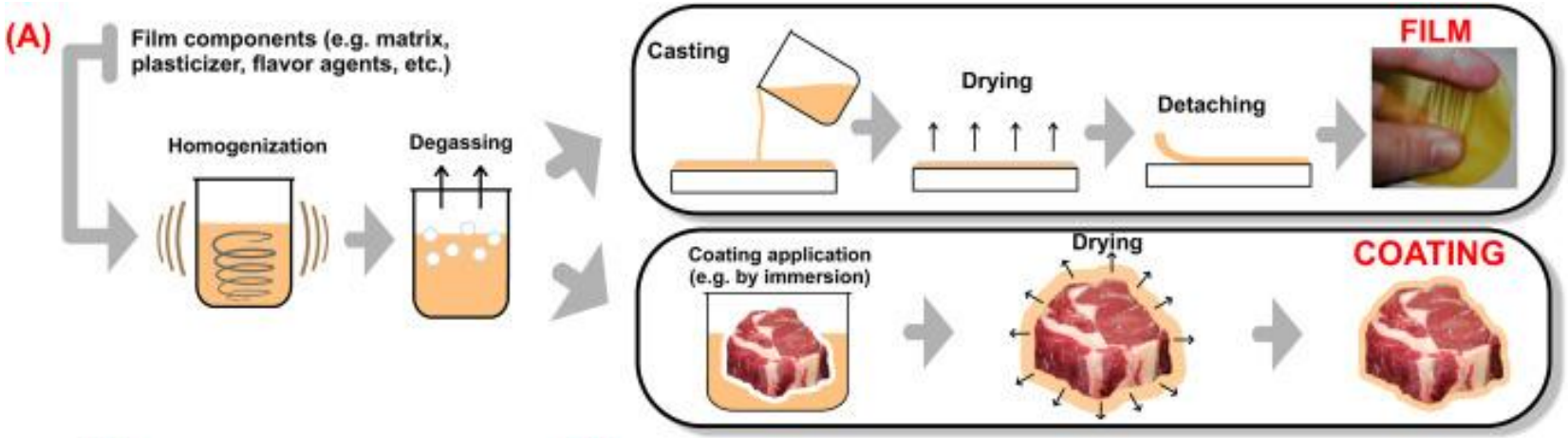
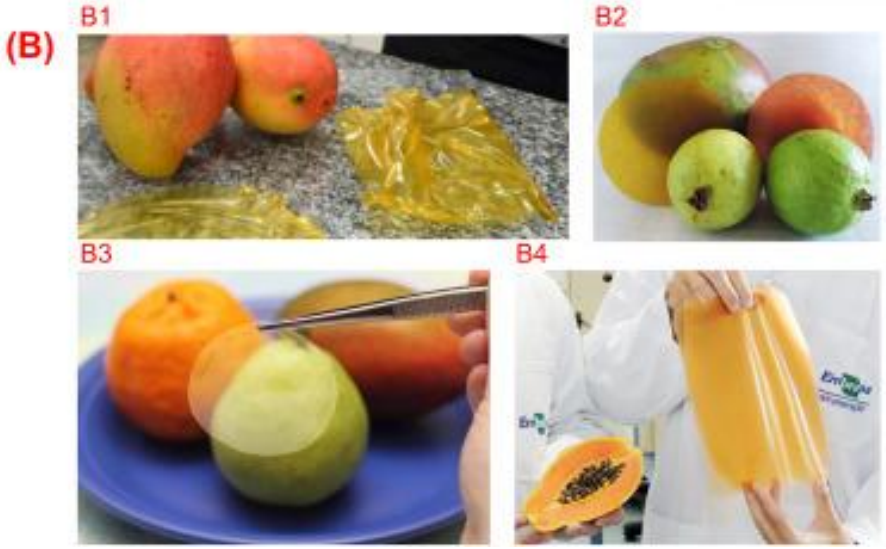
Common Applications

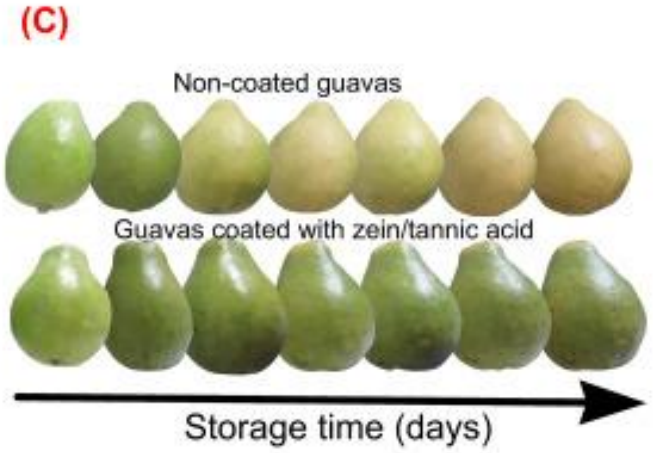
Fruits and Vegetables: Applying chitosan, alginate, or starch-based coatings to mangoes, apples, or citrus fruits to minimize weight loss and browning.
Meats and Fish: Using polysaccharide-based coatings to prevent moisture loss ("drip") and maintain tenderness.
Confectionery: Utilizing chocolate, waxes, and icing to protect candies and baked goods.

Key Benefits
Extended Shelf Life: By reducing moisture loss and oxygen exposure, they slow down ripening and decay.
Sustainability: Edible coatings often use agricultural by-products, helping to reduce food waste and plastic packaging reliance.
Improved Quality: They maintain firmness, flavor, and color, and can be used to hold spices or nutrients

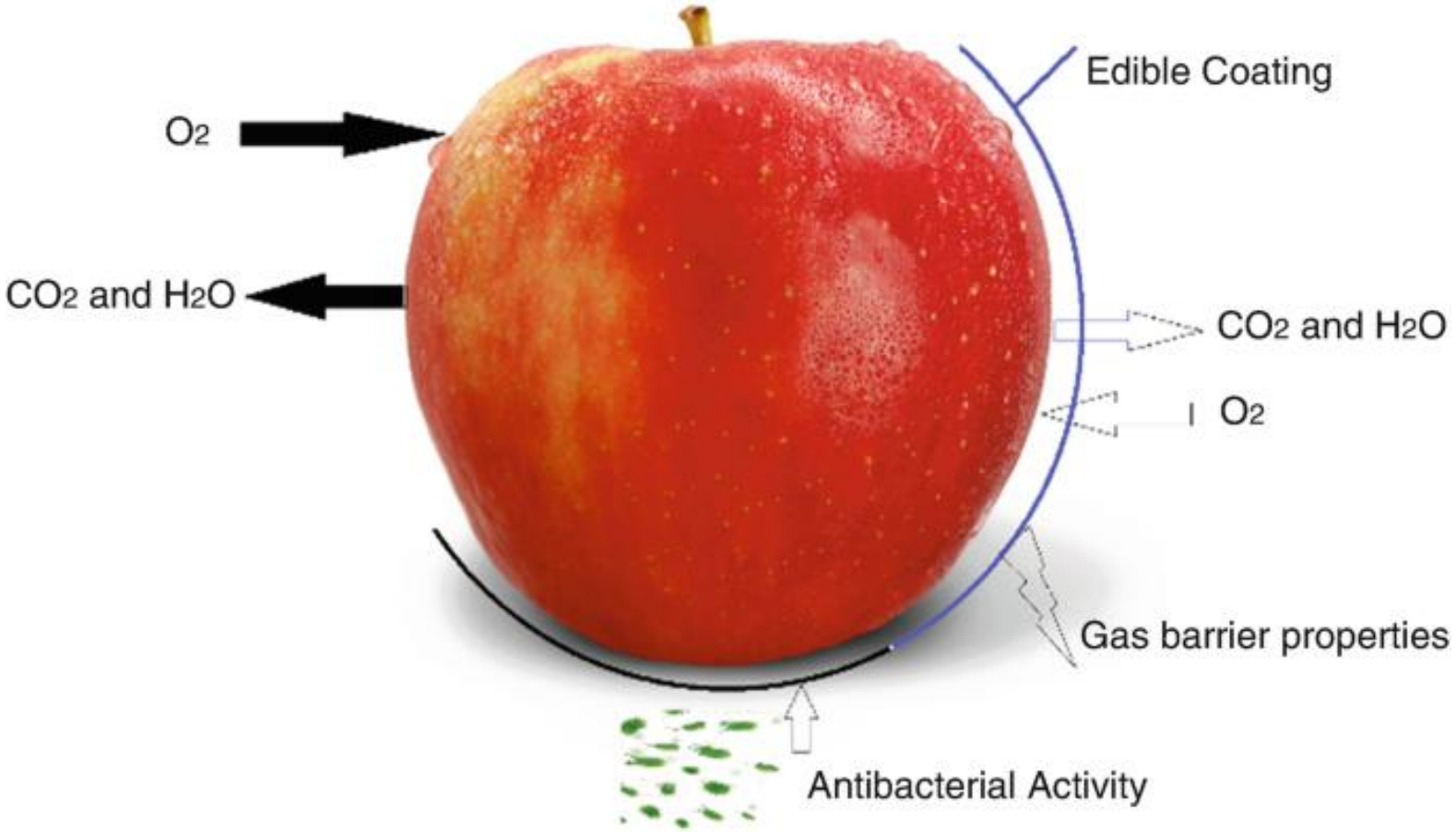
EDIBLE COATINGS
可食用涂层包装







EDIBLE COATINGS
可食用涂层包装



BIODEGRADABLE PACKAGING
生物可降解包装

Biodegradable coatings and films are eco-friendly, bio-based alternatives to conventional plastic packaging, designed to decompose safely in soil or compost. Made from renewable sources like plant proteins (soy, pea), polysaccharides (starch, cellulose, chitosan), and lipids, these materials, including edible options (e.g., casein milk protein), are used for food preservation, improving shelf life, and reducing environmental pollution.

Key Materials and Properties

Polysaccharides: Starch, cellulose, chitosan, and alginate provide excellent film-forming properties and are abundantly available.

Proteins: Soy, pea, whey, and casein protein films offer high oxygen barriers.

Biodegradable Polymers: Poly(lactic acid) (PLA) is a widely used, FDA-approved bio-based polymer for rigid and flexible packaging.

Composition: Often include plasticizers to reduce brittleness and active ingredients (antioxidants, antimicrobials) for food preservation.

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Methods of Preparation

Solution Casting: A simple, common method involving drying a biopolymer solution or gel to form a film.
Extrusion/Thermal Pressing: Pushing materials through a die to create films, allowing for higher efficiency and consistent quality.
Electrohydrodynamic Atomization (EHDA): Using high voltage to create films from liquids.

Applications and Benefits

Food Packaging: Used directly as edible coatings for produce or as films for wraps.
Environmental Impact: These materials decompose into natural components in soil.
Functional Properties: Coatings are designed to have good adhesion to food surfaces and low gas permeability, preventing food oxidation and spoilage.

KEYS TO SUCCESSFUL DEVELOPMENT OF CHINA CONVENIENCE FOOD AND PREPARED FOOD INDUSTRY

中国方便食品和预制食品成功发展的关键

1. 现代化
2. 国际化
3. 科技化
4. 工业化
5. 规模化
6. 系统化
7. 信息化
8. 标准化
9. 质量化
10. 市场化
11. 机器化
12. 组织化
13. 计划化
14. 安全化

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