# From Plastic to Paper: A Sustainable Revolution in Food Packaging

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# Introduction

- Introduction: In recent years, the detrimental effects of single-use plastic on the environment have become increasingly apparent
- Let’s discusses the environmental impact of single-use plastic, highlights the benefits and types of paper packaging, addresses challenges and considerations, and examines collaborative efforts and industry examples

# The Environmental Impact of Single-Use Plastic:

- Single-use plastic poses a severe threat to our planet

# The Rise of Paper-Based Food Packaging

- Biodegradability and recyclability: Paper is derived from renewable resources and can decompose naturally, making it an eco-friendly choice
- Reduced carbon footprint: The production of paper generates fewer greenhouse gas emissions compared to plastic, especially when using recycled paper
- Health considerations: Unlike certain plastics, paper-based materials are generally safer for food contact, minimizing potential health risks
- Cartons: Paper cartons, often made from recycled fibers, are commonly used for packaging milk, juices, and other beverages
- Boxes and trays: Paper boxes and trays offer excellent alternatives to plastic containers for food takeout and delivery

# The Rise of Paper-Based Food Packaging

**Wrappers and pouches: Paper wrappers, such as those used for sandwiches or snacks,**

**Shopping Bags: Instead of using plastic bags, opt for paper bags**

**Food Packaging: Look for food products that use paper-based packaging instead of plastic**

**Straws: Instead of plastic straws, consider using paper straws**

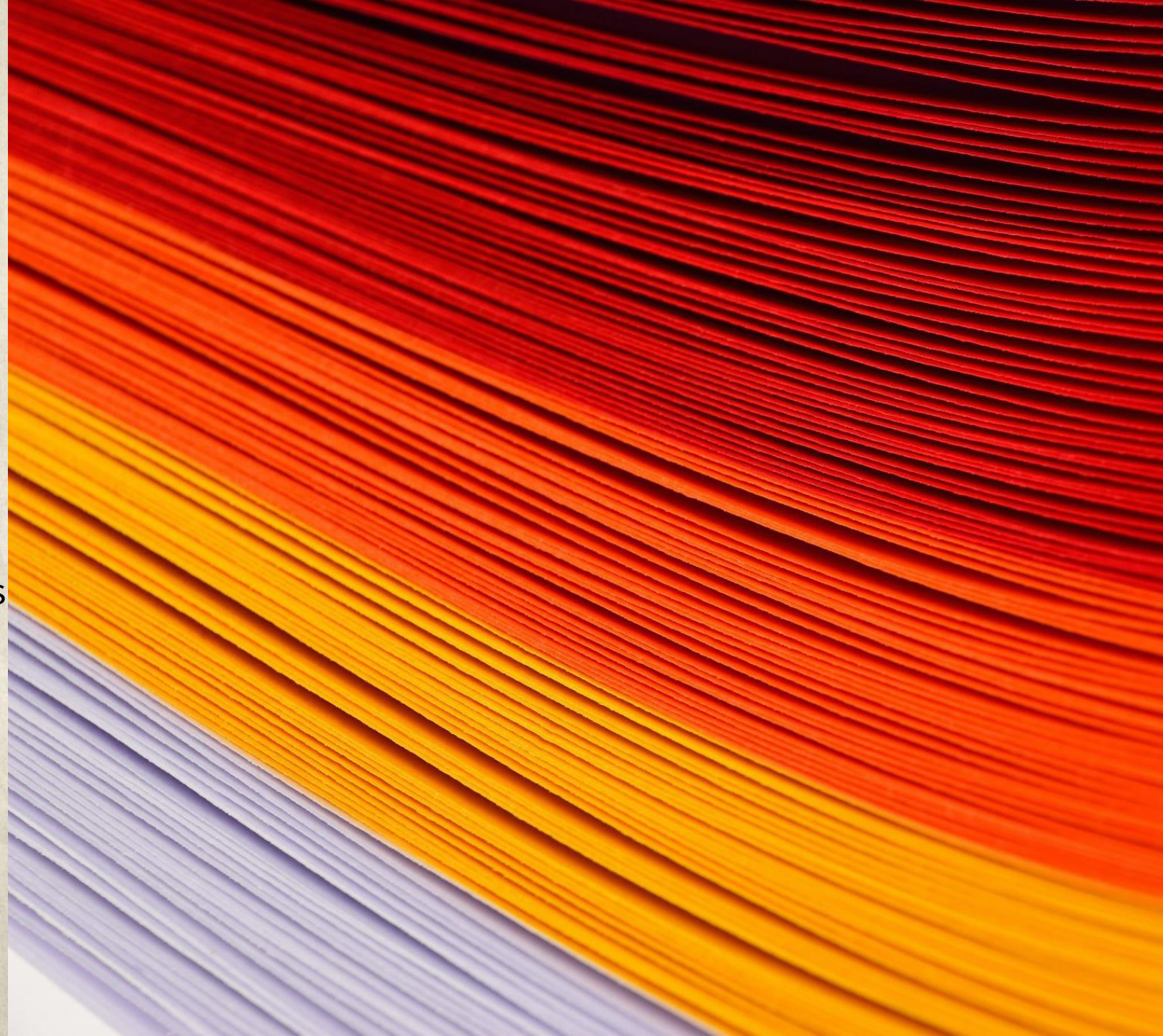
**Takeout Containers: Many restaurants are shifting towards using paper-based takeout containers rather than plastic containers**

**Coffee Cups: Some coffee shops offer paper cups that are lined with a thin layer of biodegradable material instead of plastic**

**Wrapping Paper: Instead of using plastic wrapping for gifts, use recyclable or compostable paper-based wrapping paper**

# Collaborative Efforts and Industry Examples

- Government initiatives: Governments worldwide are implementing regulations to reduce single-use plastic waste, incentivizing businesses to adopt paper-based alternatives
- Industry shifts: Many food and beverage companies have embraced sustainable practices by transitioning to paper-based packaging

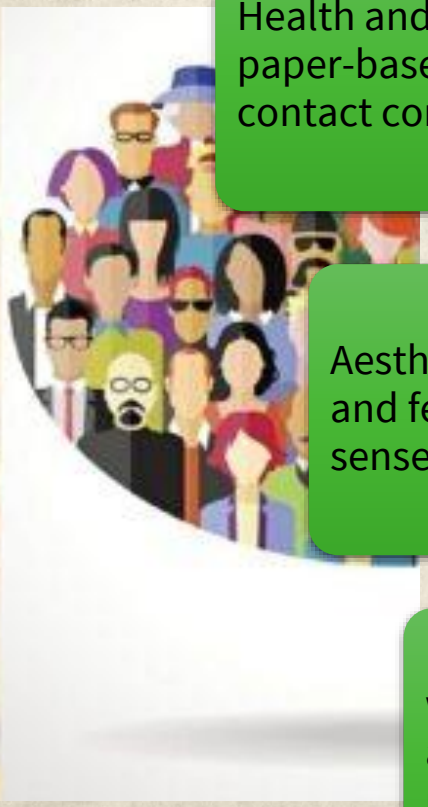


# Greaseproof paper market 2023-2033

- The global greaseproof paper market has experienced significant growth, reaching a valuation **of US$1.27** billion in 2023
- It is projected to grow at a compound annual growth rate of 5.5% and reach **US$2.1 billion** by 2033
- Greaseproof paper plays a crucial role in food storage and packaging due to its ability to repel grease, making it suitable for long-term food preservation
- The demand for greaseproof paper is expected to rise in the coming years, primarily driven by the food packaging sector's high requirements

# Public opinion

Environmental Concern: Many individuals are increasingly concerned about the environmental impact of single-use plastic, particularly in the food industry where packaging waste is significant



Health and Safety: Consumers often perceive paper-based packaging as safer for food contact compared to certain types of plastic

Aesthetics and Perception: The visual appeal and feel of paper packaging can evoke a sense of authenticity and sustainability

Recycling and Waste Management: Paper is widely recognized as a recyclable material, and consumers appreciate the ease of recycling paper-based packaging compared to certain types of plastic

# Public opinion

Functional Considerations: While paper-based packaging has its advantages, some consumers express concerns about its durability and resistance to moisture or grease

Education and Awareness: Consumer sentiment is often influenced by awareness campaigns, educational initiatives, and transparent labeling

# The Way Forward

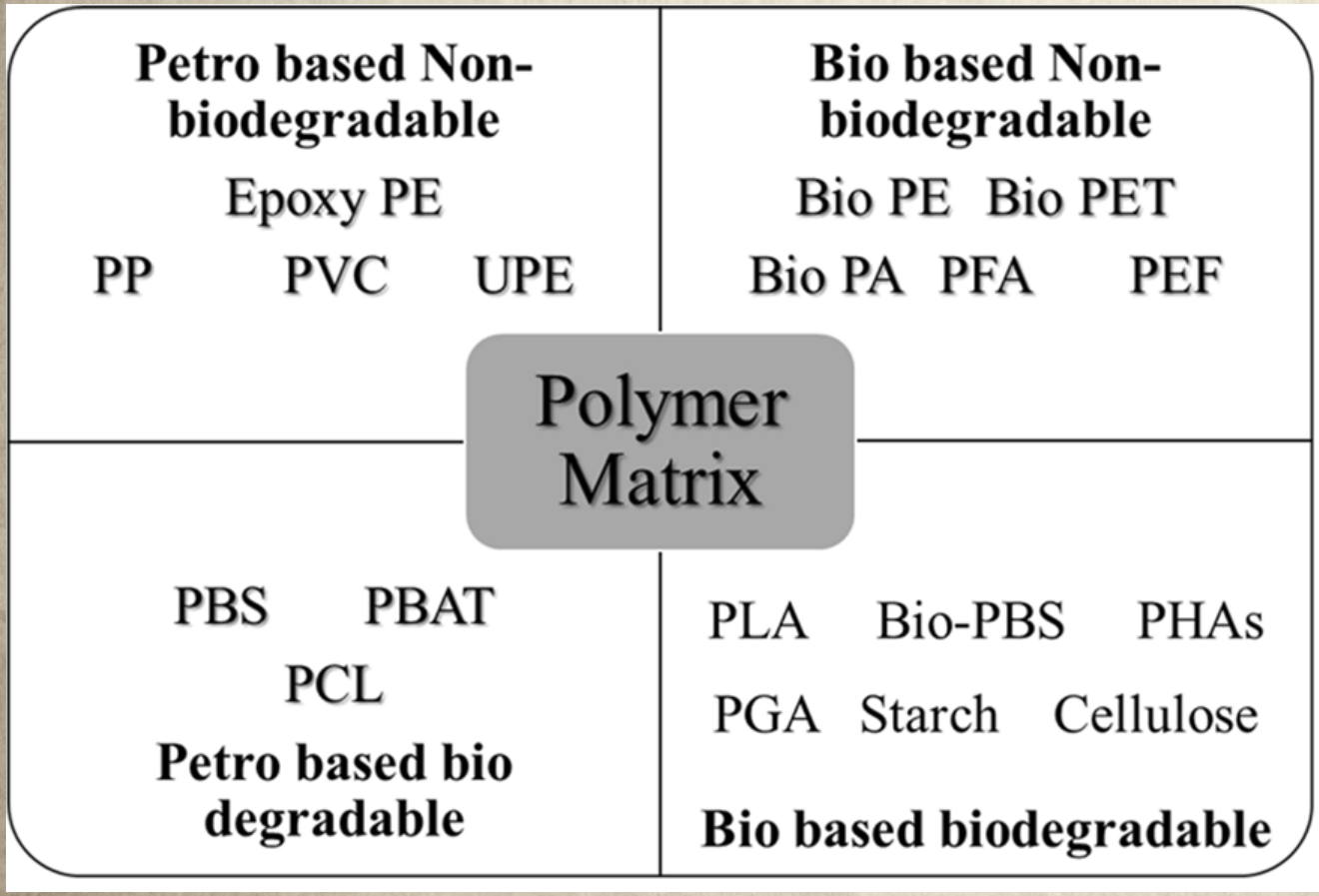
- Consumer choices and behavior: As individuals, we can contribute to this movement by actively choosing paper-based alternatives, supporting brands committed to sustainability, and advocating for responsible packaging choices
- Innovation and research: Continued investment in research and development is essential for improving the durability, performance, and recyclability of paper-based packaging solutions

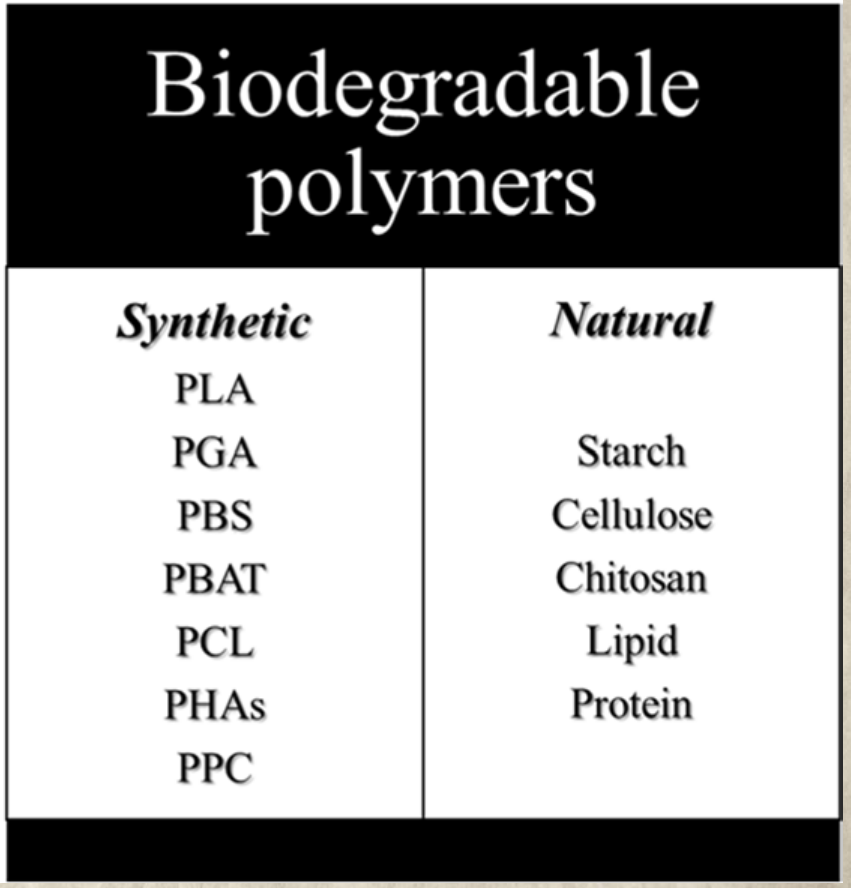
# Products Available

# BIODEGRADABLE POLYMERS FOR HIGH BARRIER PAPER COATING

| Coating material | Water vapor transmission rate (g or cc/m$^2$/day) | | Oxygen transmission rate (cc/m$^2$/day) | | COBB (g/m$^2$) | | Contact angle (°) | |
|---|---|---|---|---|---|---|---|---|
| | Uncoated | Coated | Uncoated | Coated | Uncoated | Coated | Uncoated | Coated |
| Polylactic acid | 339 | 57 | | 302 | 25.6 | 3.17 | – | – |
| Polyvinyl alcohol/zein | 826.0 ± 18.8 | 288.0 ± 14.5 | – | 128.0 ± 14.7 | – | – | 105.0 ± 0.0 | 98.8 ± 2.4 |
| Cellulose nanofibers and nano clay | 28.55 ±0.7 | 5 ± 0.2 | – | 6.7 ± 0.05 | – | – | – | – |
| Chitosan + micro crystalline cellulose + protein | 99.6 | 60.3 | – | – | 95.43 | 76.13 | – | – |
| Chitosan | 298.17 ± 3.34 | 280.69 ± 2.92 | – | – | 45.21 ± 2.75 | 39.74 ± 1.44 | – | – |
| Chitosan | 501.5 ± 3.4 | 594 ± 57.9 | > 10,000 | 1.1 ± 1.3 | – | – | – | – |
| Cellulose ester | 566 ± 45 | 1805 ± 151 | > 400,000 | 18,050 ± 1510 | – | – | 59.8 ± 2.4 | 66.4 ± 1.8 |
| Bio-polyethylene | 566 ± 45 | 4 ± 1 | > 400,000 | 11090 ± 986 | – | – | 59.8 ± 2.4 | 97.6 ± 2.9 |
| Polylactic acid | 566 ± 45 | 52 ± 6 | > 400,000 | 386 ± 37 | – | – | 59.8 ± 2.4 | 77.2 ± 1.1 |
| Cellulose undecanoyl ester | 622.4 ± 21.4 | 192.0 ± 8.1 | – | – | – | – | 0–10 | 100–110 |
| Chitosan-graft -Poly(dimethylsiloxane) | ~ 1200 | ~ 800 | – | – | ~ 35 | ~ 15 | 70 | 120 |
| Zein | ~ 1200 | ~ 500 | – | – | ~ 35 | ~ 25 | 70 | 90 |
| Poly(dimethylsiloxane)-Zein | ~ 1200 | ~ 400 | – | – | ~ 35 | ~ 5 | 70 | 100 |
| Chitosan-Zein | ~ 1200 | ~ 1300 | – | – | ~ 35 | ~ 30 | 70 | 90 |
| Poly(dimethylsiloxane)-Chitosan-Zein | ~ 1200 | ~ 1000 | – | – | ~ 35 | ~ 20 | 70 | 120 |
| Polylactic acid and Polycaprolactone | ~ 800 | ~ 600 | – | – | ~ 5 | ~ 4 | 68 | 72 |
| Semi-crystalline Polylactic acid | – | – | – | – | ~ 25 | ~ 5 | 62 | 79 |
| Corn starch | 297.36 | 234.12 | – | – | – | – | 64.47 | 117.93 |
| Natural rubber latex and alpha-1,3 glucan | – | – | – | – | ~ 160 | ~ 30 | 53.8 | 94.2 |

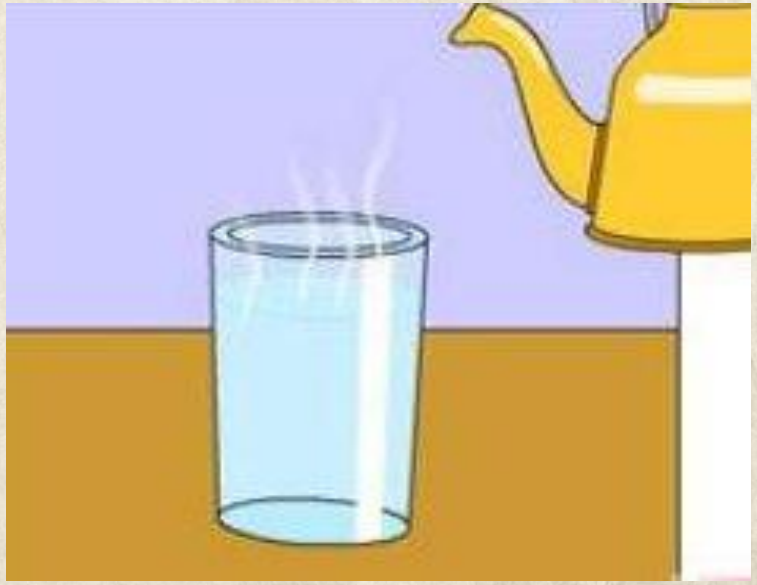
**Classification of different kinds of polymers, such as biodegradable and non-biodegradable and classification of biodegradable polymers based on origin, such as synthetic and natural**



# Waterproof  Agent

Improve the binding capacity and mechanical properties of the fibers, such as the tensile property, stiffness and water resistance of pulp fiber.



# Product Available:

Barrier Coating :
Dosage is 0.25% (relative to dry pulp) + F-type Grease Proof agent 0.1%

100℃ hot water, for 30min.

# Oil repellent | Application

## Pulp molding procedure

Waterproof agent

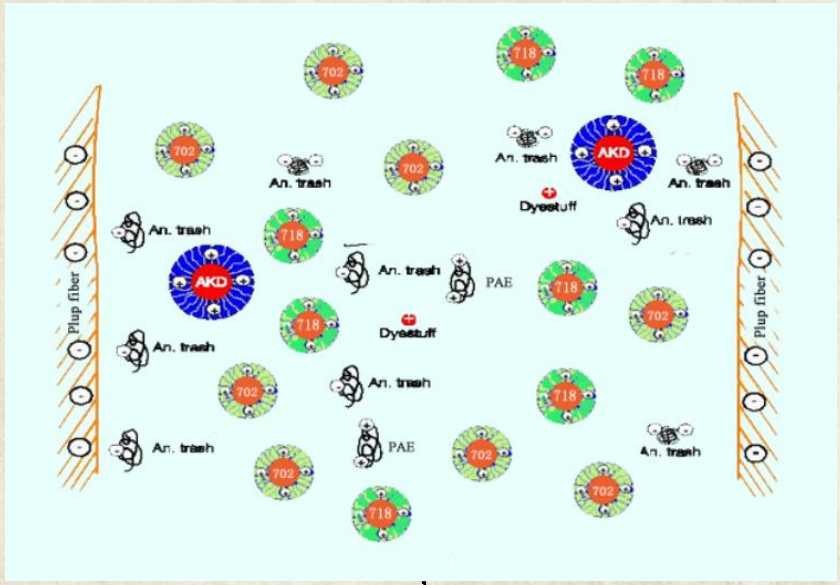
Oil repellent

AKD sizing agent

**Pulp fiber**

Wood pulp / Sugarcane pulp

Mix




Dry

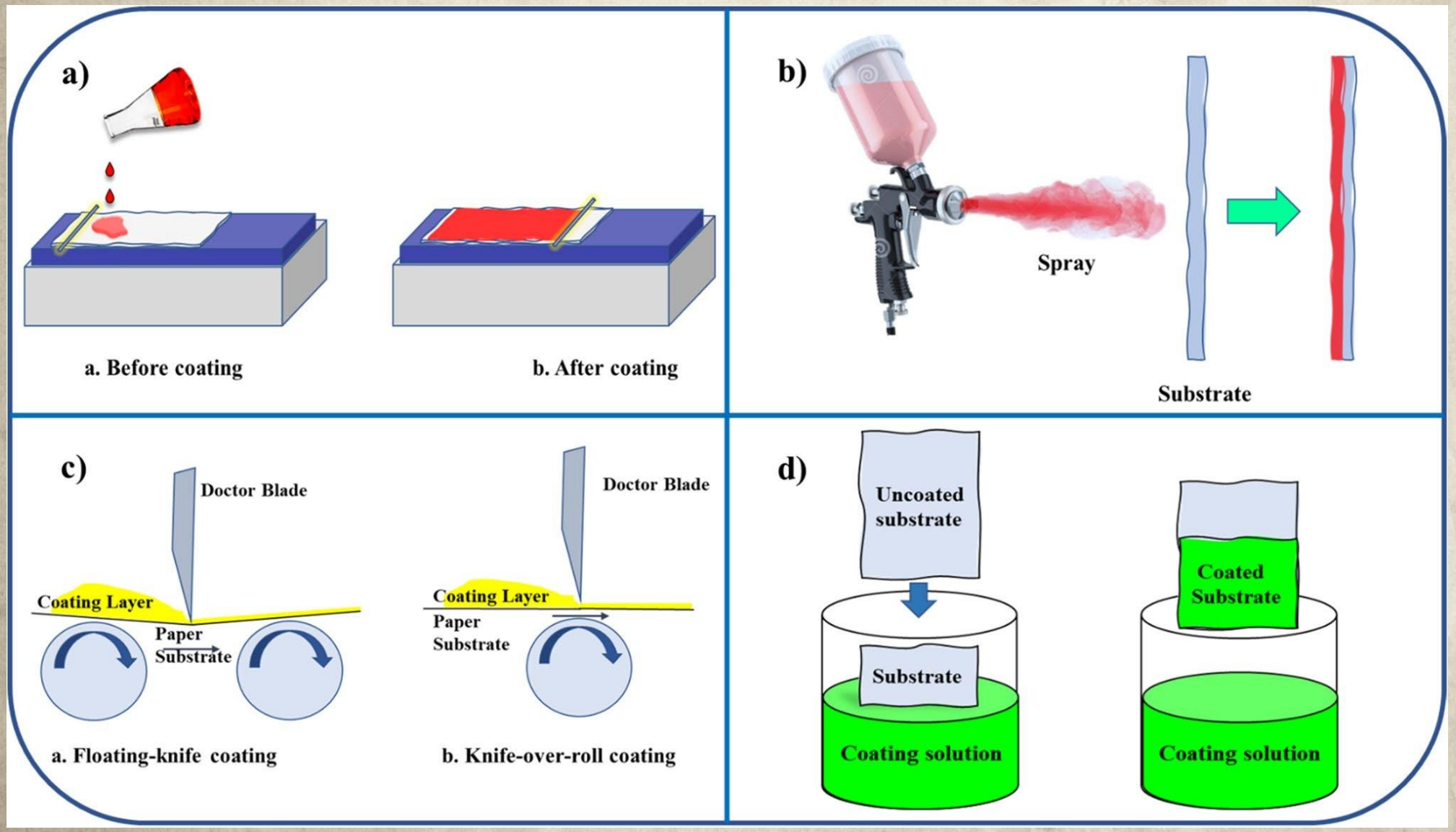
Water proofing product Usage:

**The range of product dosage is in the range of**

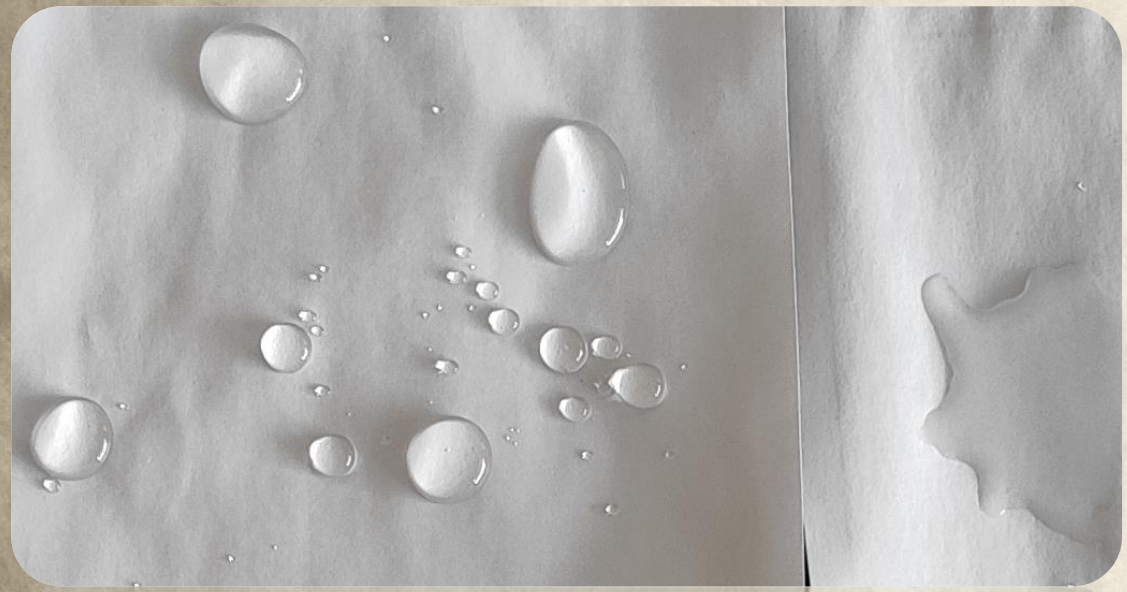
0.5%-3.0% (relative to dry pulp)

# Different methods for coating on the paper substrate:

a) Bar coating. B) Spray coating. C) Knife coating. D) Dip coating



# SURFACE BARRIER AGENT



Physical & Chemical Properties of Surface Barrier Products

| Items | Requirement |
|---|---|
| Appearance | White liquid |
| Solid Content(%) | 40.0±1.0 |
| pH value | 6.0-10.0 |
| Viscosity(mPa·s, 25℃) | ＜ 500 |
| Ionicity | Weak anionic |

## Surface application:

The recommended dosage is 4-10g/m$^2$. Before used, it is recommended to check compatibility with other chemicals.

# Conclusion

REPLACING SINGLE-USE PLASTIC WITH PAPER-BASED ALTERNATIVES, ESPECIALLY IN FOOD PACKAGING, IS AN IMPROTANT STEP TOWARDS A MORE SUSTAINABLE FUTURE

BY UTILIZING PAPER CARTONS, BOXES, WRAPPERS, AND CUPS, WE CAN SIGNIFICANTLY REDUCE PLASTIC WASTE AND ITS DETRIMENTAL EFFECTS ON THE ENVIRONMENT

THROUGH COLLABORATIVE EFFORTS AND CONSCIOUS CHOICES, WE CAN CREATE A WORLD WHERE PAPER BECOMES A VIABLE AND ECO-FRIENDLY SUBSTITUTE FOR SINGLE-USE PLASTICS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