

Enhancing Paper's Barrier Properties for Sustainable Plastic Alternatives

By : SMS Innovation Center

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OUTLINES

*ZONAL SEMINAR
CUM WORKSHOP 2023*

**Enhancing Paper's Barrier
Properties for Sustainable
Plastic Alternative**

Why barrier coating for food packaging ?

The move towards compostable food packaging

Non-Fluorochemical Water-Based Polymer

Grafted Starch Emulsion by SMS Innovation

Global Food Packaging Market

Driving Factors of
Global Food
Packaging
Market



High Demand for Convenience Food
Increasing Demand for Food Packaging

Rising Demand for Convenience Food
are served in Ready-to-Eat Containers

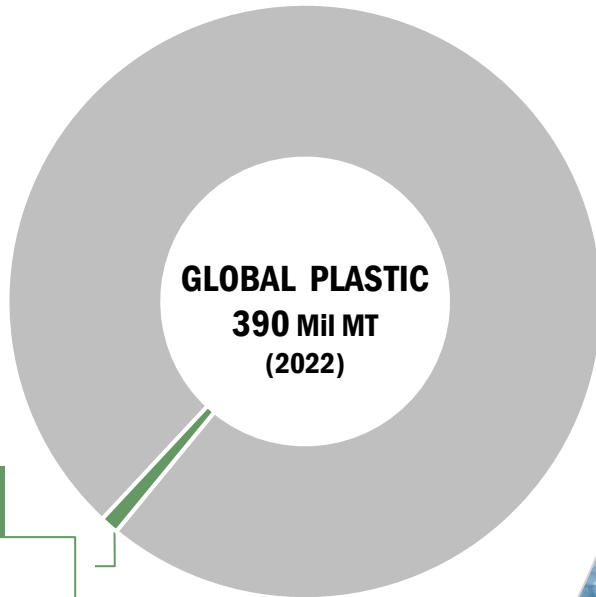
Fast-Moving Lifestyle of Consumers
Increasing Demand For Fast Food Items

**PACKAGING INNOVATION
IN THE FOOD INDUSTRY
TO FAVOR GROWTH**

The Move Towards Compostable Food Packaging

Petroleum based plastics release CO₂ causes Global Warming:
Temperatures over land increased by 1.32 °C.

Global Plastic Production



Bioplastic

1%
2.23 Mil MT
in 2022

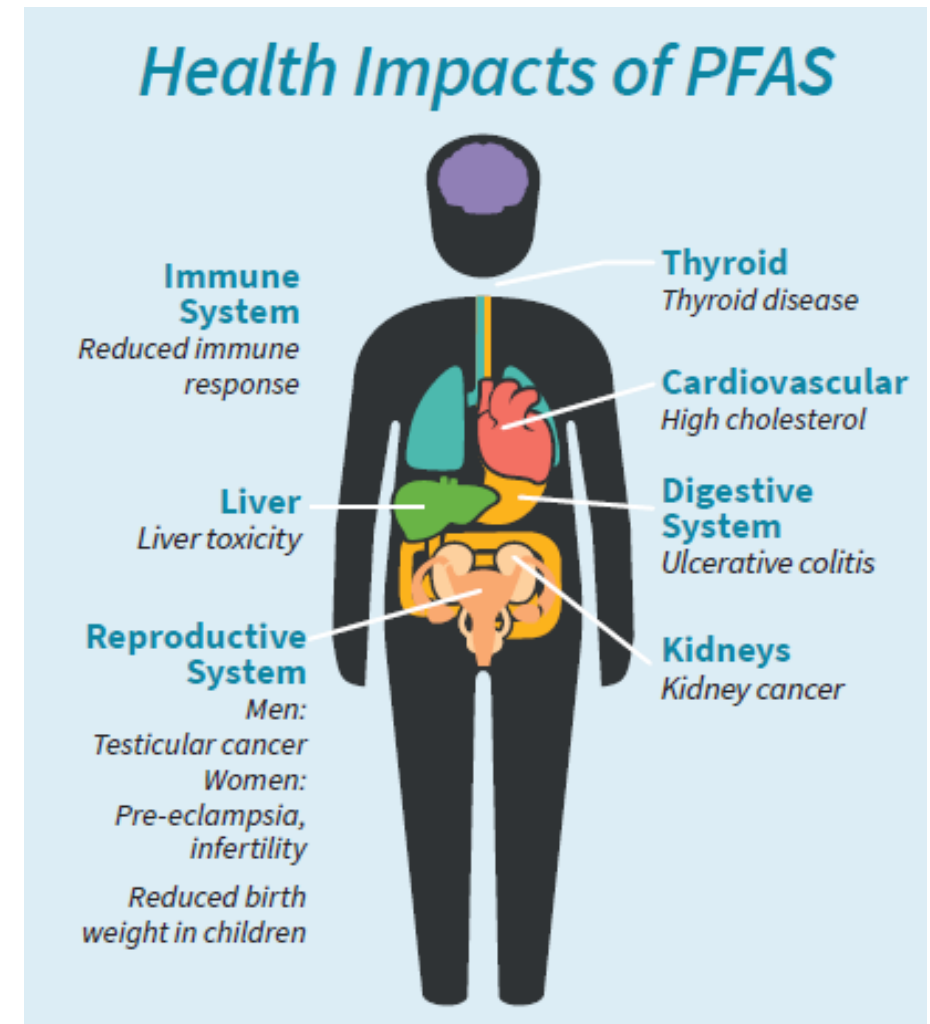
The Move Towards Compostable Food Packaging

Per- and polyfluoroalkyl substances (PFASs) are strongly linked to:

- Kidney and testicular cancer
- High cholesterol
- Hormone disruption
- Harm to the immune system
- Liver toxicity
- Reduced birth weight

PFAS chemicals migrate from packaging to food

- Microwave popcorn bags, sandwich wrap, muffin papers, and food wrappers.
- The amount of PFAS chemicals moving into food is increased by heating.



The Move Towards Compostable Food Packaging

How to
solve pain
point ?

**Non-fluorochemical Water-based
Polymer Grafted Starch Emulsion**

Oil & Water
Resistance paper
Solution

- ✓ Excellent Barrier Properties
- ✓ Recyclable
- ✓ Compostable
- ✓ Affordable

THE PRODUCT PROTECT & SAVE
OUR WORLD



The Move Towards Compostable Food Packaging

**SMS Innovative
Barrier Coating Material :**
**The safe alternative from
PFASs**

INTERNATIONAL REGULATION & RECOMMENDATION

US FDA for food contact packaging

- 175.300 Resinous and polymeric coating
- 176.170 Components of paper and paperboard in contact with aqueous and fatty foods
- 176.180 Components of paper and paperboard in contact with dry food

BfR XXXVI. Paper and board for food contact

Application Methodology

**Conventional
Coating**

Metered Size Presses

Air-knife

Blade

**Printing
Presses**

Flexographic

Gravure

Non-Fluorochemical Water-Based Polymer Grafted Starch Emulsion

Materials & Methods

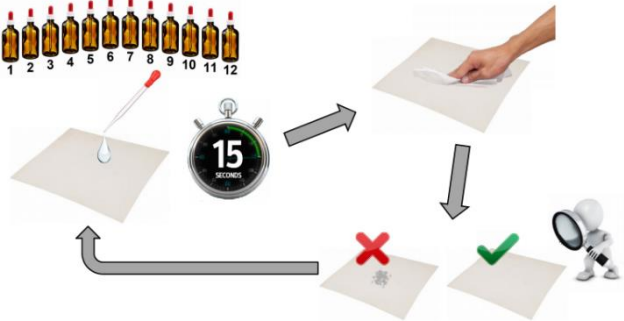
Emulsion properties	
Appearance	: Milky White Liquid
pH	: 7.0 - 10.0
Viscosity	: 100-300 cPs @ 25°C
Solids content	: 45-50%

Paper properties

Base paper	Glassine	Kraft liner	Solid bleached board
Basis weight (gsm)	35	70	230
Thickness (µm)	45	100	400
Bulk (cm ³ /g)	1.3	1.4	1.6
Density (kg/cm ³)	774	695	641
Smoothness (mL/min)	164	1,060	1,030
Porosity (mL/min)	47	560	400

Oil & Grease Resistance Testing

TAPPI T559 cm-02
- The kit test



Water Resistance Testing

TAPPI T441 om-09
- Cobb test (60 sec.)

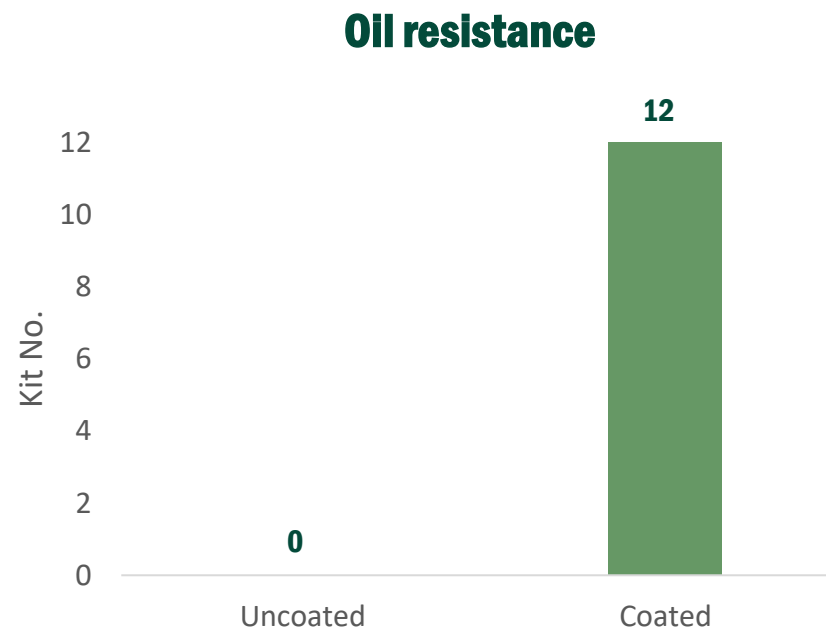
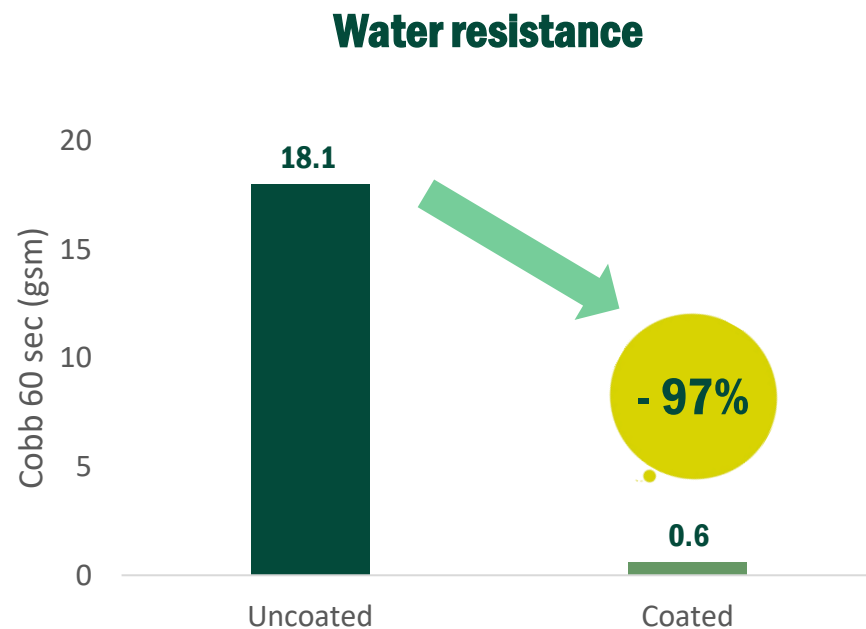


Laboratory Results

Glassine paper, 35 GSM

- Coat weight = 5.8 gsm

Base paper	Uncoated	Coated
Basis weight (gsm)	34.8 ± 0.9	39.6 ± 0.1
Coated weight (gsm)	-	5.8 ± 0.2
Thickness (µm)	45	45
Bulk (cm ³ /g)	1.3	1.1
Density (kg/cm ³)	774	880
Smoothness (mL/min)	164	140
Porosity (mL/min)	47	5



Food Wrapping & Tray

Laboratory Results

Glassine paper, 35 GSM

- Coat weight = 5.8 gsm



Food Wrapping & Tray

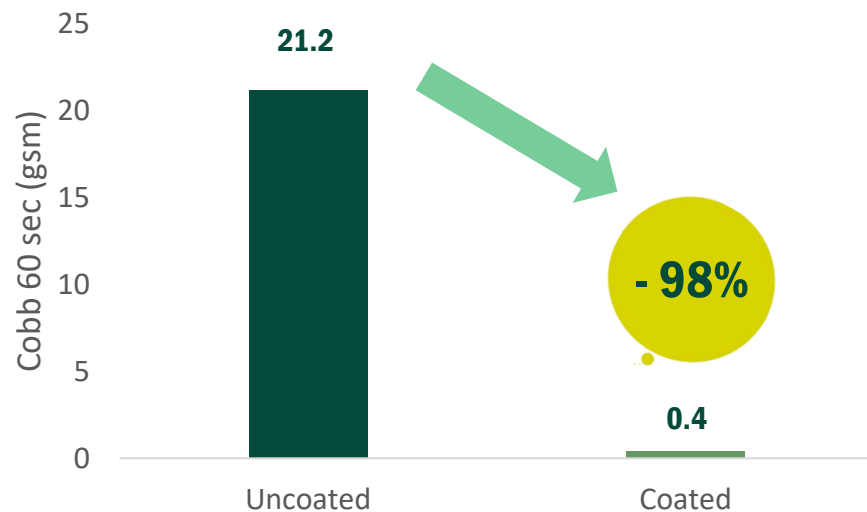
Laboratory Results

Kraft liner, 70 GSM

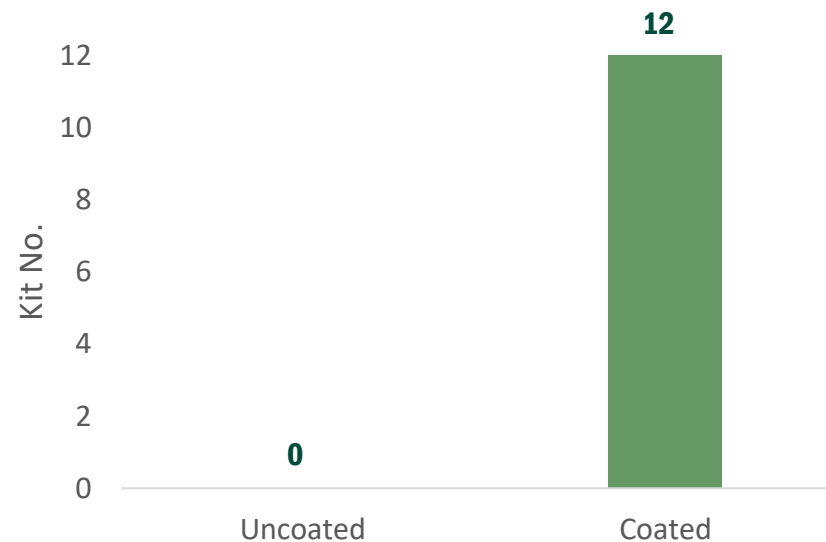
- Coat weight = 10.3 gsm

Base paper	Uncoated	Coated
Basis weight (gsm)	69.5 ± 0.3	79.4 ± 0.6
Coated weight (gsm)	-	10.3 ± 0.4
Thickness (µm)	100	110
Bulk (cm ³ /g)	1.4	1.4
Density (kg/cm ³)	695	721
Smoothness (mL/min)	1,060	860
Porosity (mL/min)	560	5

Water resistance



Oil resistance



Food Wrapping & Tray

Laboratory Results

Kraft liner, 70 GSM

- Coat weight = 10.3 gsm



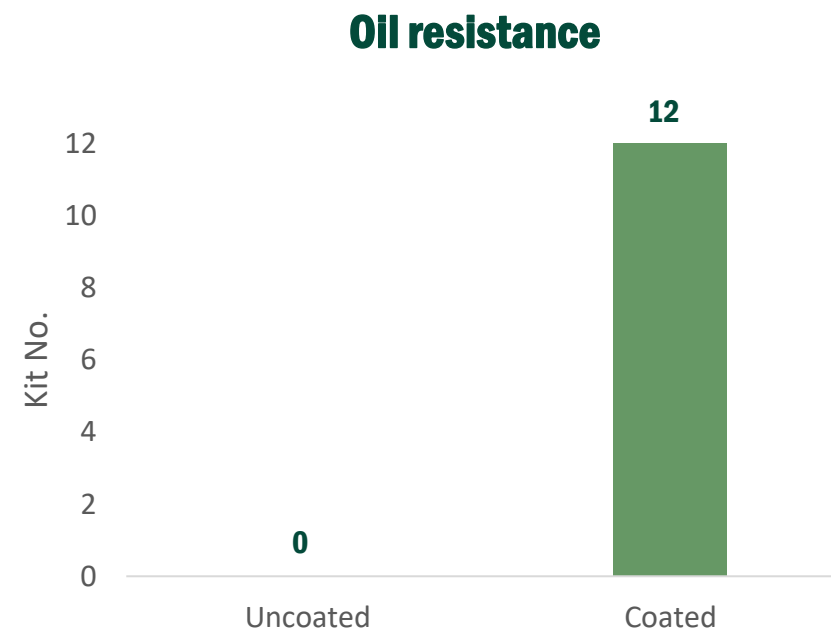
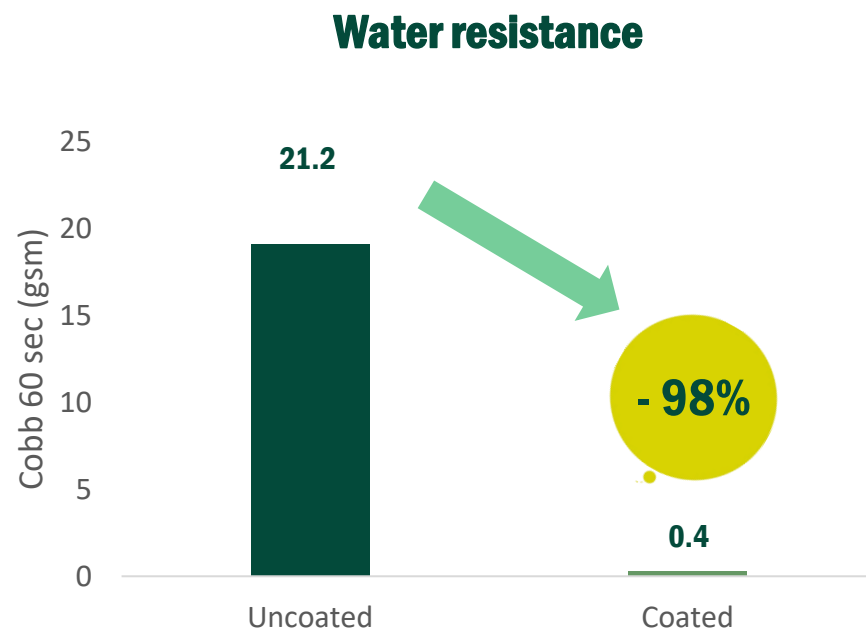
Food Wrapping & Tray

Laboratory Results

Solid bleached board, 230 GSM

- Coat weight = 15.8 gsm

Base paper	Uncoated	Coated
Basis weight (gsm)	256.5 ± 1.9	271.1 ± 1.2
Coated weight (gsm)	-	15.8 ± 0.4
Thickness (µm)	400	410
Bulk (cm ³ /g)	1.6	1.5
Density (kg/cm ³)	641	661
Smoothness (mL/min)	1,030	990
Porosity (mL/min)	400	20



Food Wrapping & Tray

Laboratory Results

Solid bleached board, 230 GSM

- Coat weight = 15.8 gsm



Food Wrapping & Tray

Laboratory Results

**Water resistance
(95±5 °C, 10 min)**

**Oil resistance
(65±5 °C, 10 min)**

Uncoated



**Coated
(60 GSM)**



Pulp Mold Packaging

Plates, Fast Food Boxes, Bowls, Tableware

Enhancing Paper's Barrier Properties for Sustainable Plastic Alternatives

Polymer Grafted Starch Emulsion Complied With US FDA

175.300 Resinous and polymeric coating

176.170 Components of paper and paperboard in contact with aqueous and fatty foods

176.180 Components of paper and paperboard in contact with dry food

Different Type of Based Paper were Tested by TUV Rheinland (Thailand)



Glassine paper, 35 GSM



Kraft liner, 70 GSM



Solid bleached board, 230 GSM

Home Compostable

0 day

30 days

60 days

**PE Coated Paper
(18 GSM)**



















**Polymer Grafted
Starch Emulsion
(16 GSM)**



Non-Fluorochemical Water-Based Polymer Grafted Starch Emulsion

Summary

Item	PE lamination	Polymer grafted starch emulsion
Water resistance properties		
Oil and grease resistance properties		
Repulpability		
Recyclability		
Compostability		
Heat sealability		
High temperature resistance		
Environmental friendly		



= Excellent



= Average



= Poor

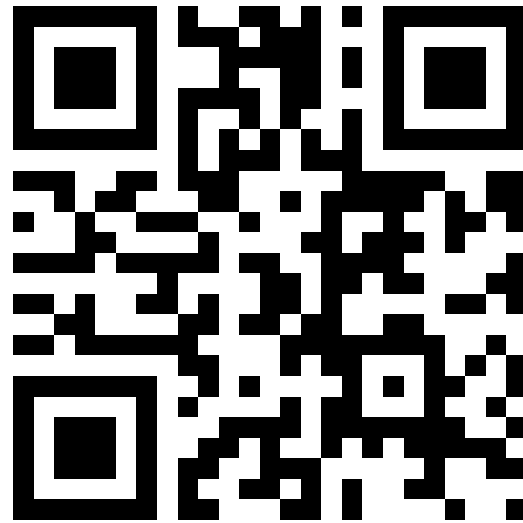
Conclusion

Using Non-fluorochemical Water-based Polymer Grafted Starch Emulsion as a Barrier Coating Material Provides Benefits

- **Excellent water resistance**
- **Excellent oil & grease resistance**
- **Reduce and replace plastic used in food packaging**
- **Complied with U.S. FDA 175.300 / 176.170 / 176.180**
- **Home compostable within 60 days by in house testing**



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