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Benefits of KCL Biowax in dispersion coating applications

Watti Lehtimäki / BioHUB Webinar 17 June 2025

Contents

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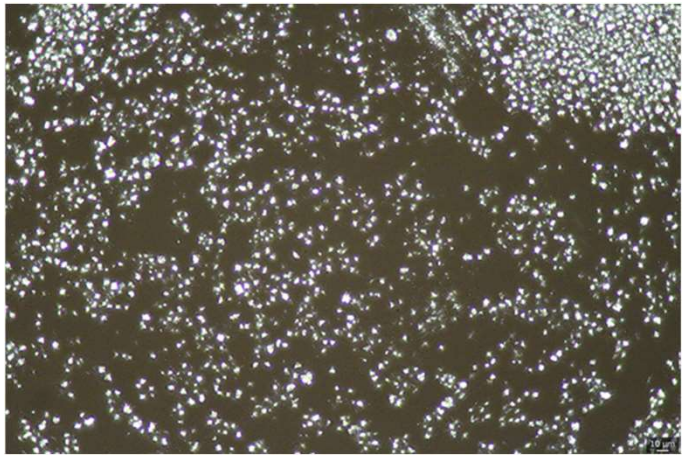


KCL Biowax dispersion (particles 3-8 mic)

Biowaxes

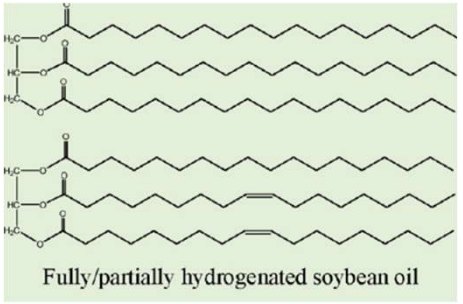
Biowaxes are natural lipids that are solids in room temperature. In plants, they are found in the cuticles and are there to prevent moisture loss.

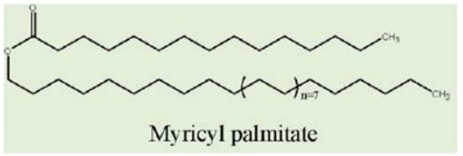
Waxes have been widely used as hydrophobization agents in different applications.

- Coating of fruits to prevent moisture loss and increase shelf life.
- Coating of outdoor garments to make them waterproof.
- Coating of automobiles to prevent sticking of dirt and ease cleaning.

Biowaxes can come from many sources, such as:

- Animals: Bee, Lac bug
- Plants: Carnauba palm, cadelilla flower, rapeseed, sugarcane, sunflower, soybean…





Jahangiri et al. ACS Environmental Au 2025 5 (2), 165-182

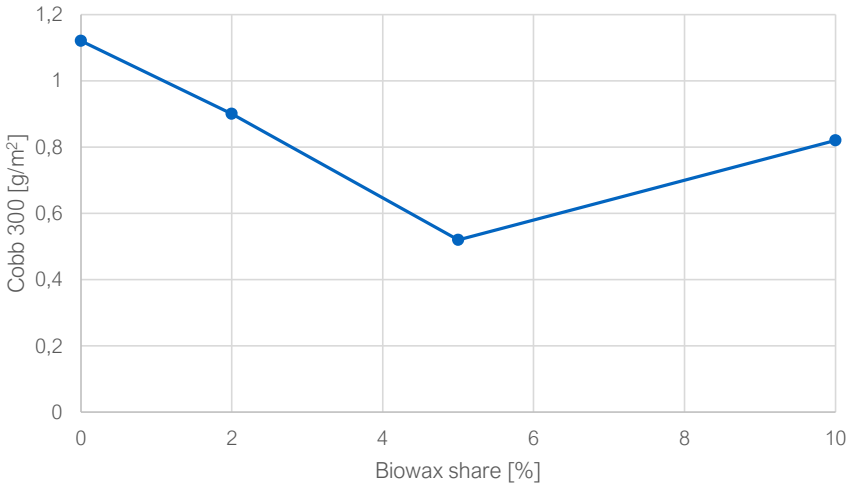
Biowax dispersions in paper coating

Increased hydrophobicity

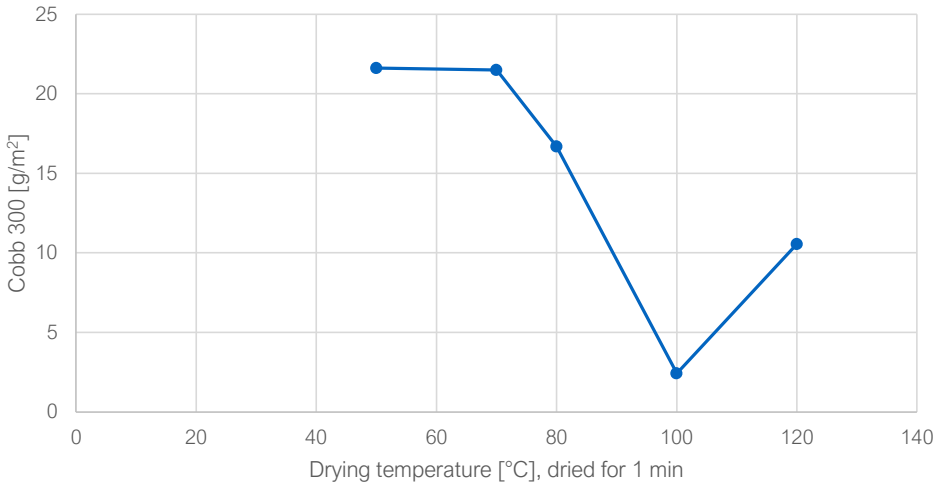
- Allow packaging of wet foods.
- Reduce food waste.

- Even a small dosage of biowax into a barrier coating can significantly improve its water resistance.
- Dosing too much can harm the film forming of the coating.
- When using coatings with majority wax content, optimizing drying is very important in order to achieve good barrier properties.

KCL Biowax in SB-latex barrier coating



Impact of drying on barrier performance of KCL Biowax coating



Biowax dispersions in paper coating

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Improved moisture barrier

- Increase shelf life of wet and dry foods.

- Moisture barrier properties on par with traditional plastic packaging materials.

Product	Coatweight, g/m^2	MVTR, g/m^2 (23C / 50% RH)
KCL Biowax on paper	5,0	14,0
KCL Biowax on cellophane	4,8	7,1
LDPE on paper[1]	12	5,5
LDPE on paperboard[1]	8,5	10,0
PLA on paperboard[1]	20	74
BOPP film[2]	20	2,8

1. Lahtinen, Kimmo (2010) “Statistical WVTR Models for Extrusion-Coated Webs in Various Atmospheric Conditions”. Doctoral Thesis, Tampere University of Technology.

2. Mo, Chen; Yuan, Wang; Lei, Wang; and Shijiu, Yin (2014) "Effects of Temperature and Humidity on the Barrier Properties of Biaxially-Oriented Polypropylene and Polyvinyl Alcohol Films,"Journal of Applied Packaging Research: Vol. 6 : No. 1 , Article 5. DOI: 10.14448/japr.01.0004

Other benefits of biowax dispersions in paper coating

Increased bio-based content of packaging:

- Reduced reliance on fossil feedstocks.
- Reduced carbon footprint.

Environmental and regulatory benefits:

- Biowaxes are outside the scope of the SUPD.
- Avoids plastic bans, taxes and EPR fees.
- Reduced microplastic pollution.
- Recyclable* and biodegradable.

Can be used to control friction properties of paper and board:

- Replace paraffin waxes as friction additives.[3]
- Antiblocking aid.[4-5]

3. Fei, Tao; Ren, Kangzi; and Wang, Tong (2020). “The Friction and Wear Behaviors of Vegetable Oil-Based Waxes, Natural Beeswax, and Petroleum Paraffin Wax”. J Am Oil Chem Soc (2020) 97: 1141–1150.
4. US20240240015A1
5. CN114555690B

Concerns

As biowaxes are very hydrophobic, using them in coatings can bring some challenges regarding downstream processing of the packaging material.

- Challenging printing using water-based inks.
- Poor adhesion with water-based glues.

- Challenges in paper recycling processes.

Compared to many polymeric coatings and synthetic waxes, biowaxes have fairly low melting points (< 82°C).

- Challenges in hot food applications and hot filling processes.

Environmental effects need to be considered when harvesting raw materials for wax production. Many sources are also food sources, which means reduced food production.

Conclusions

- Biowaxes are low cost substances with good availability, that can be utilized to create sustainable, high-performance packaging materials.
- Biowaxes are not a silver bullet, and bring with them a range of challenges to solve through coating formulation, process optimization, material structures and package design.

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Thank you for your attention!