

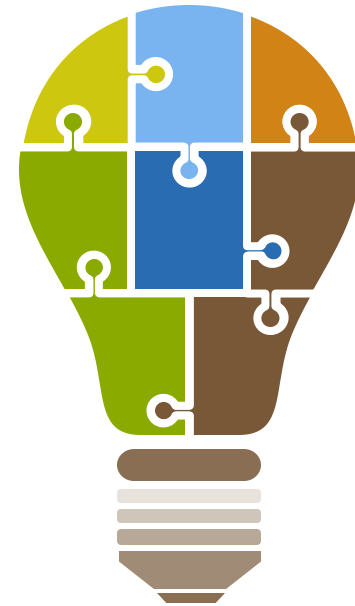


DEVELOPERS OF STRATEGIC CONSUMER PACKAGING APPLICATIONS

Smart Planet Technologies



- Smart Planet Technologies is an engineering and intellectual property firm with inventions in sustainable packaging composite materials and structures
- We partner with packaging manufacturers
- Over 30 issued patents and patents pending
- Over 2.5 billion package units sold to date through partners
- Headquarters in Newport Beach, California



Mineralized Resin

Base Resin

LD Polyethylene
Polylactic Acid (PLA)
BioPBS



Refined Minerals

Coated CaCO_3
or
 CaCO_3 + Nanoclay



+

Compounding



Mineralized Resin

(35-51% mineral by weight)



Mineralized Resin Barrier Coating Technology

Polymer + Minerals = Mineralized Resin

Mineralized Resin coatings are drop-in extrusion-coating compounds for barrier-coated paper packaging applications

Mineralized Resin coatings provides advantages over conventional 100% plastic coatings

- Less plastic
- Higher barrier performance
- Lower cost
- Engineered to be recyclable in existing paper recycling systems

I rivestimenti in resina mineralizzata sono composti pronti per l'uso nell'estrusione per applicazioni di imballaggio in carta con barriera.

I rivestimenti in resina mineralizzata offrono vantaggi rispetto ai rivestimenti in plastica 100% convenzionali:

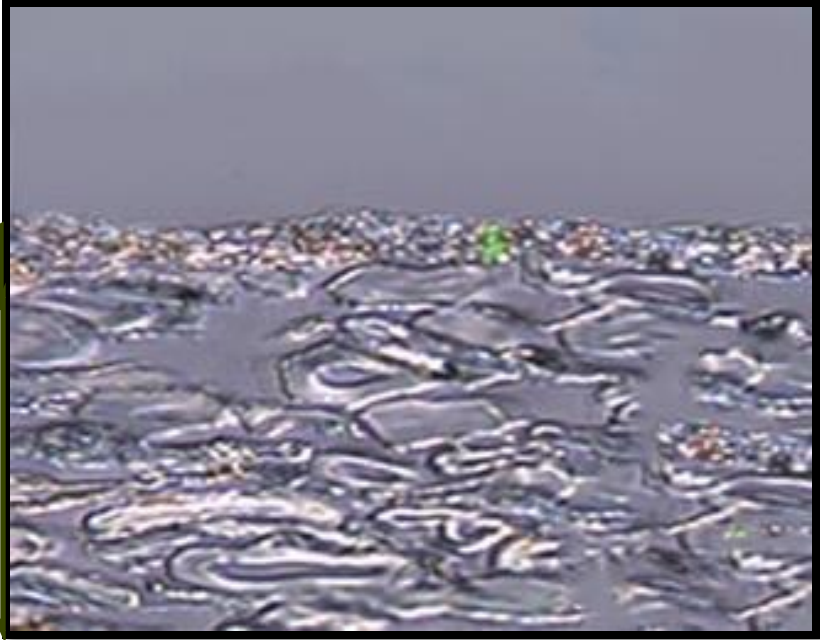
- Meno plastica
- Maggiore prestazione di barriera
- Costo inferiore
- Progettati per essere riciclabili nei sistemi di riciclaggio della carta esistenti

Cross Section of Coated Paper under Electron Microscope

Paper with Mineralized Resin

Mineralized Resin

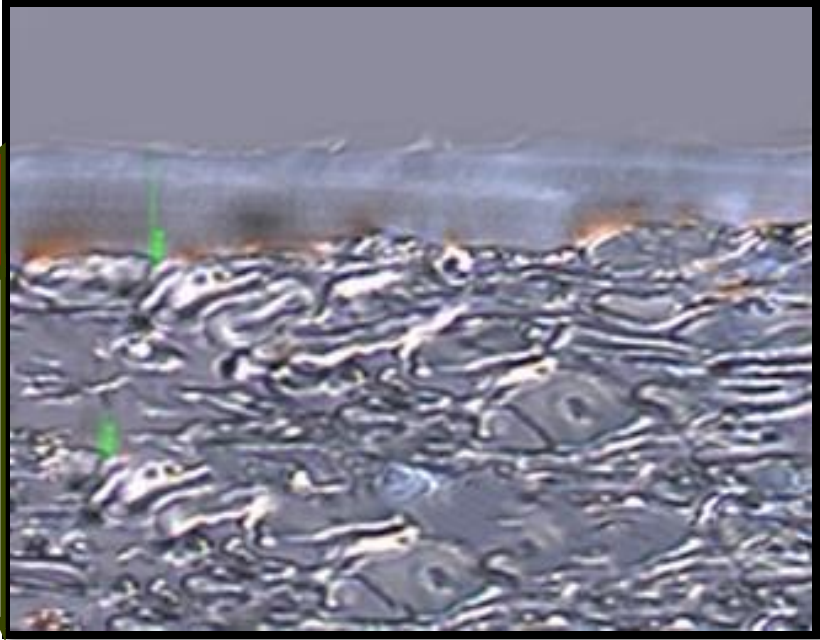
fiber layer





Paper with 100% Polymer Coating

100% plastic

fiber layer



Product Lines

		
Mineralization	Calcium Carbonate	Calcium Carbonate and Nanoclay
Optimized for	Enhancing polymer coatings in paper packaging	High barrier requirements to support transition from plastic to paper packaging
Market Focus	Foodservice Packaging Rigid Packaging	Flexible Packaging

Mineralization of Polyethylene

earthcoating®

HYPERBARRIER

	Polyethylene	EarthCoating	HyperBarrier
<i>Base Resin</i>	<i>Polyethylene</i>	<i>Polyethylene</i>	<i>Polyethylene</i>
<i>Mineralization</i>	<i>None</i>	<i>CaCO₃</i>	<i>CaCO₃ + Nanoclay</i>
Line Speeds	Baseline	Equal	Equal
Manufacturing	Baseline	Equal	Equal
Coatweight	Baseline	Equal	Equal
Oxygen Barrier	Poor	Poor	20x improvement
Moisture Barrier		50% improvement	15x improvement
Oil Barrier (Kit)	11	12+	12+
Heat Sealing		Improved	Improved
Recyclability	Contamination	Recyclable	Recyclable

Presentation Sections

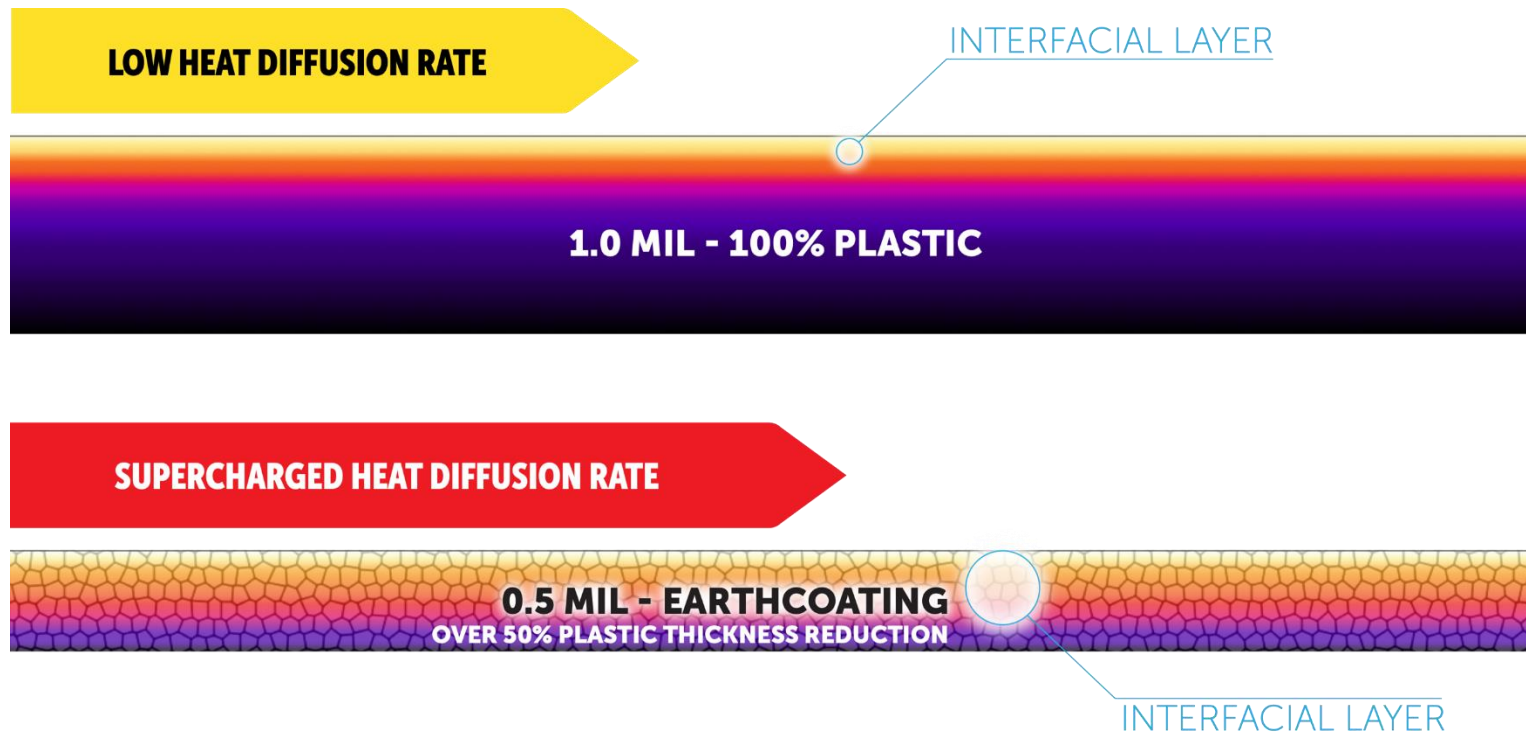
- Heat Seal
- Barrier Performance
- Recyclability

Presentation Sections

- **Heat Seal**
- Barrier Performance
- Recyclability

Improved Heat Sealability

- Mineralization absorbs and dissipates heat more quickly, activating a larger portion of the polymer content and improving heat seal bonding and fiber tear strength

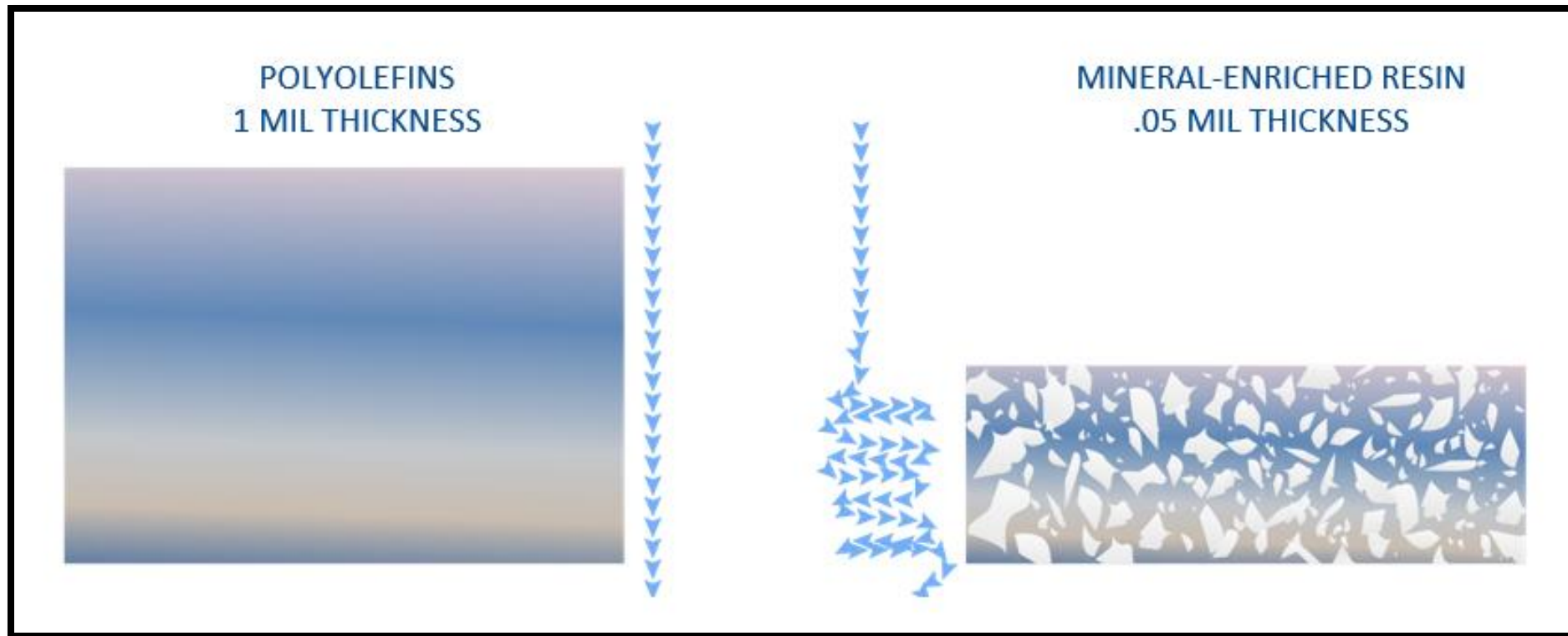


Presentation Sections

- Heat Seal
- **Barrier Performance**
- Recyclability

Improved Barrier Performance

- Oxygen, Moisture and Oils have a steady transmission rate through polymers
- Minerals create a tortuous path, slowing the transmission rate
- Calcium Carbonate creates an improvement for moisture and oil barrier performance
- With the addition of nanoclays to create a ternary nanocomposite, the result is an exponential improvement in barrier performance for oxygen, moisture, and oils



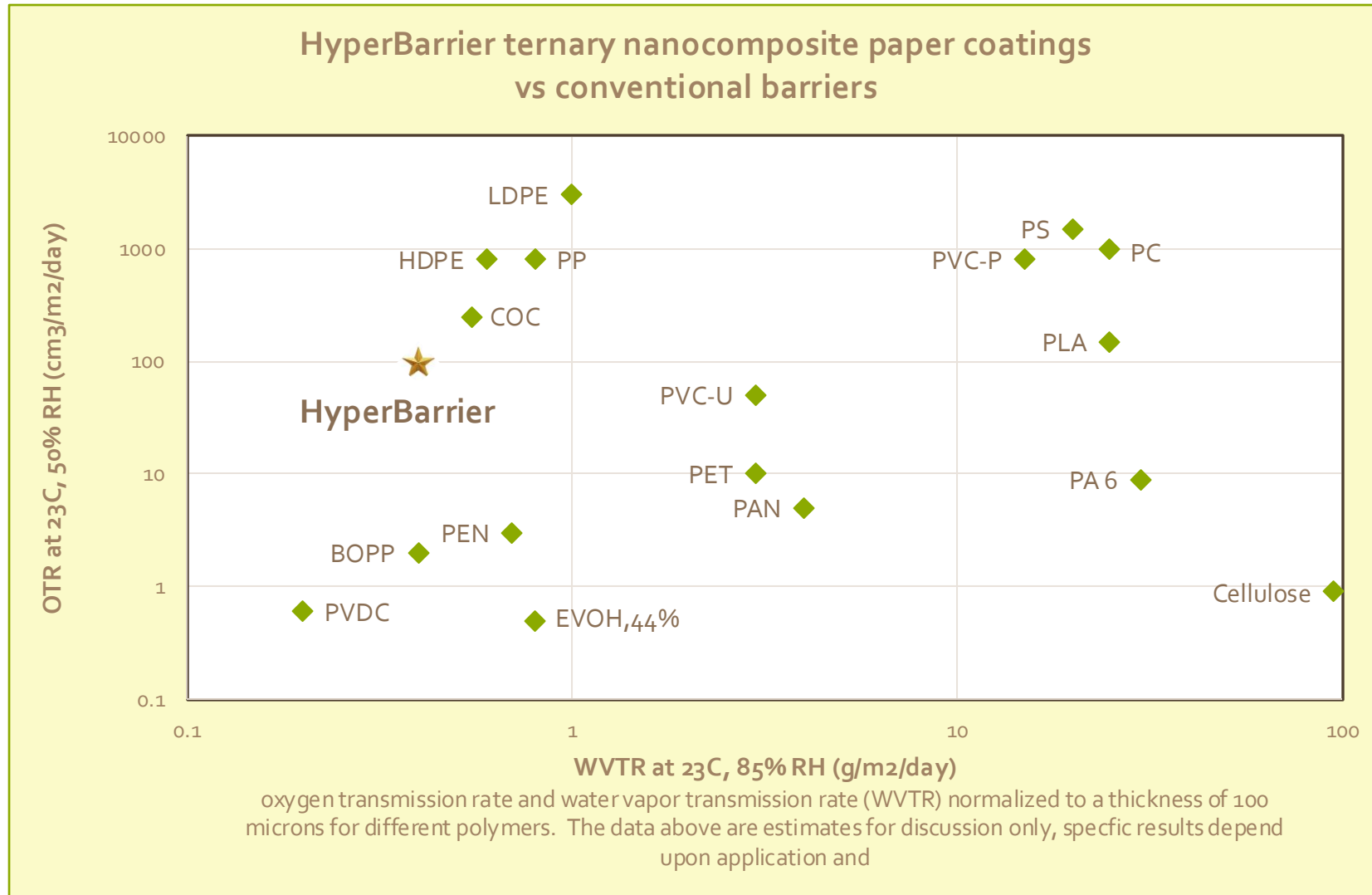
Monolayer Barrier Comparison Chart for Paper Packaging

Monolayer Barrier Layer	Material Type	OTR (cc/m ² /24 hr)	MVTR (g/m ² /24 hr)	Plastic Reduction	Recyclable in Paper Packaging	Compostable
HYPERBARRIER	Extrusion Coating	295-590	1.5 – 1.9	35-45% reduction in polymer	Yes - Universally Recyclable	No
earthcoating®	Extrusion Coating	7711-8800	12 - 14	40%-51% reduction in polymer	Yes - Universally Recyclable	Optional
HDPE	Extrusion Coating	2300-3100	4.7 – 7.8	100% polymer	Plastic Contamination	No
LDPE	Extrusion Coating	7000-8500	16 - 23	100% polymer	Plastic Contamination	No
PLA	Extrusion Coating	1500-2100	120-170	100% polymer	Plastic Contamination	Yes
BPET	Film Lamination	83-91	16-20	100% polymer	Plastic Contamination	No
BOPP	Film Lamination	900-1100	1.5 – 6.2	100% polymer	Plastic Contamination	No
OPP	Film Lamination	1550-2500	15-18	100% polymer	Plastic Contamination	No
Biax Nylon 6	Film Lamination	19-39	30-60	100% polymer	Plastic Contamination	No

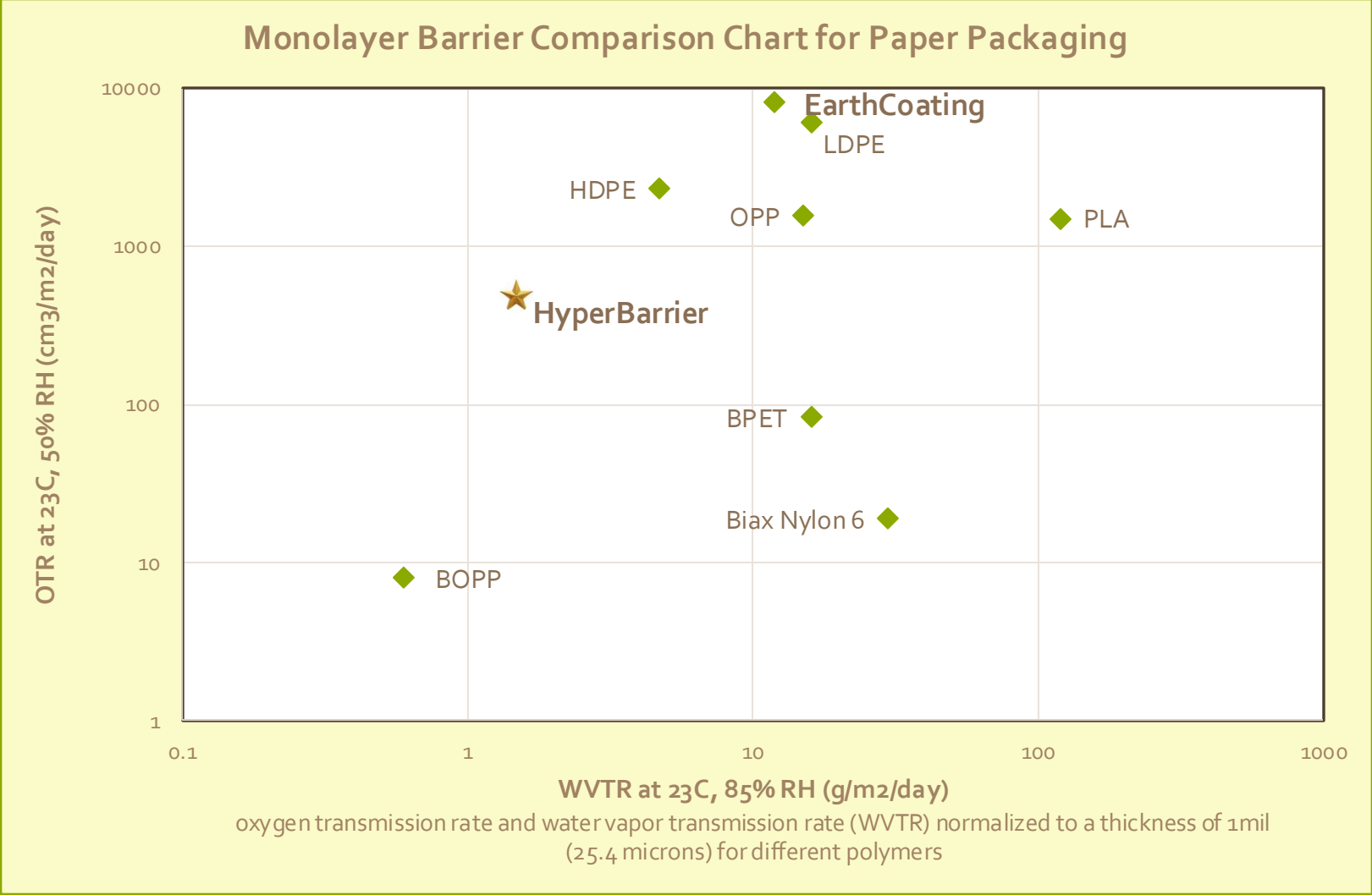
*HyperBarrier test standard: WVTR per Tappi T448 23C @85% RH. Oxygen Barrier per Mocon procedure ASTM F2622, per CTS-020

**The data above are estimates for discussion only, specific results depend upon application and uses.

HyperBarrier ternary nanocomposite vs conventional barriers



Monolayer Barrier Comparison Chart for Paper Packaging



Presentation Sections

- Heat Seal
- Barrier Performance
- **Recyclability**

Recyclability in barrier coated papers

- Paper recycling systems are designed to recover fibers and separate them from all other materials
 - Paper repulping and recycling equipment have great difficulty with plastic coatings
 - Paper repulping and recycling equipment are designed for and very capable of removing clay coatings, mineral fillers, inks, adhesives, staples, paper clips, and organic matter
-



“Could we make a clay coating that is also a barrier coating?”

Could we design a barrier coating that has the performance of polymer coatings for packaging, but be as easy to process as a clay coating for recycling? Can we mix minerals with polymers to create a coating that meets everyone’s objectives and requirements?

Recyclability

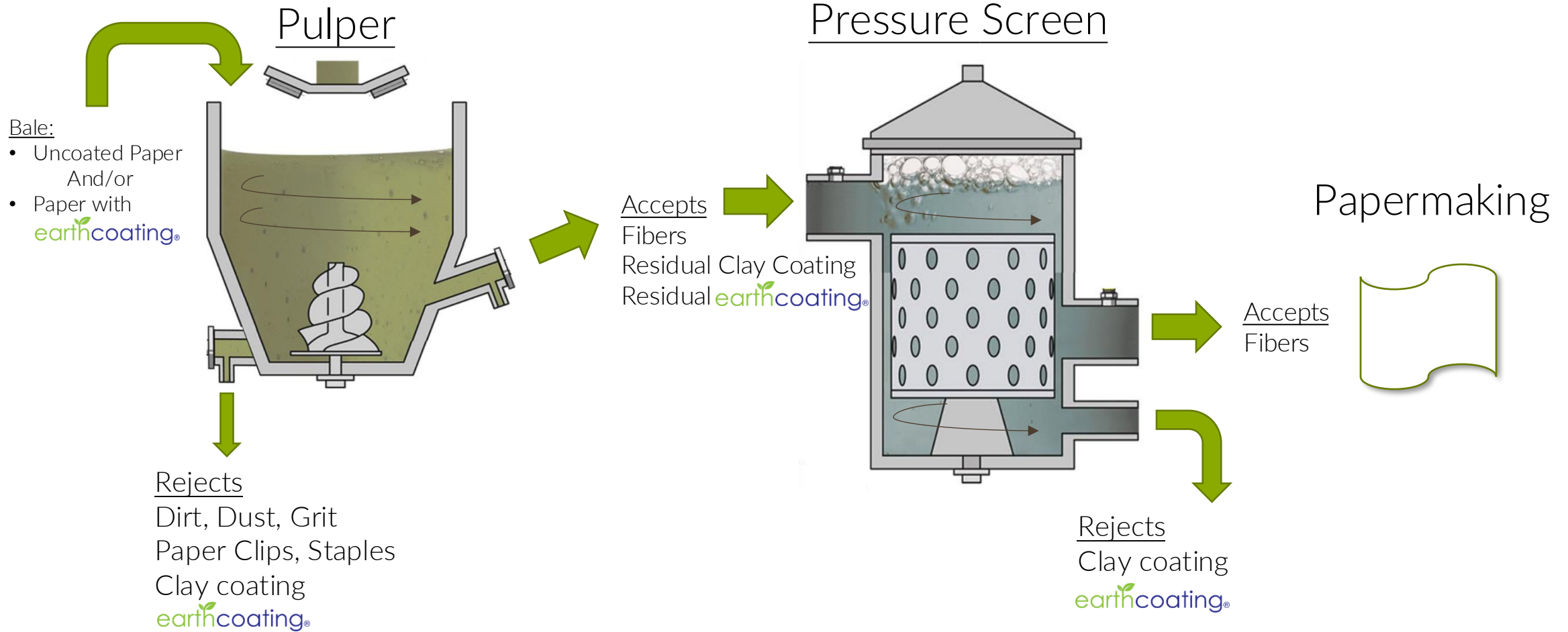
- Mineralized resins provide all the performance and cost metrics required for barrier coated packaging solutions
- Mineralized resins act as clay coating for the purposes of recycling
- All recycling systems are designed to manage clay coatings
- Therefore, all recycling systems are compatible with mineralized resins

Mineralized resins and clay coatings are recyclable because:

- Density: Both are denser than water so resin and sink in the pulper, and residuals sink in the centrifugal cleaners
- Size: Mineralized resins and clay coatings particles are too small to clog the screening process



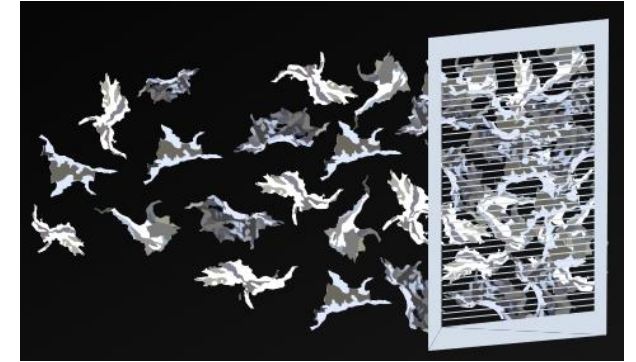
Simplified Recycling Process – Paper with Mineralized Resin



Recyclability of alternatives

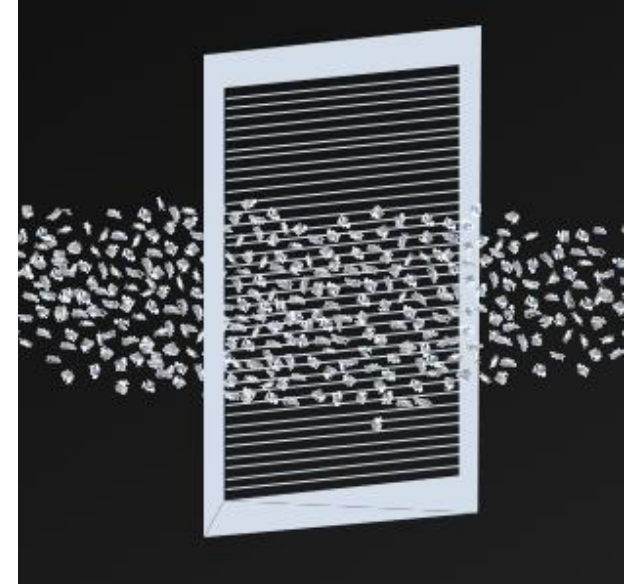
Why Polyethylene coatings are problematic

- The pulper breaks the polyethylene into large sturdy flakes that block the pressure screens
- Polyethylene coating is less dense than water, so the polyethylene floats along with the fiber into the screening process



Why Dispersion Coatings may be problematic

- Within the pulper, the coating on the surface of the paper appears to readily fragment into microplastic and nanoplastic size and moves forward with the fiber through the screening process
- Dispersion coatings do not cause problems to the recycling process, however the vast majority of polymer particles seem to be embedded in the recovered fibers, and therefore into the recycled paperboard, which may alter paperboard performance



Mineralized Resin Recyclability Certification – AAA

CERTIFICATE

Recyclability of Packaging

The company receives the certification of recyclability for the following packaging.

Designation

reCUP (beverage cup, ca. 300 ml)

Test result

Allocation to path/specification:	Mixed Waste Paper, type 5.01
Recycling path:	Mixed Waste Paper, type 5.01
Recyclate (final product):	Paper fibres

Test standard/ scope of application: Requirements and assessment catalogue of the institute cyclos-HTP (state of 03.08.2017)

In accordance with the test results and the examination documents the recyclability of the packaging amounts to:

95 % (EU, CH)

This certificate (No. 2062-2018-000293) is valid until the **31.05.2020** (2 years upon issue) relating to the countries identified in the assessment report. This certificate will lose validity in case of qualitative or quantitative changes of packaging components.

* (with adaptations from 16.01.2019)

Aachen, dated 23.05.2018*


Dr. Joachim Christiani
Publicly appointed and sworn expert for the IHK for packaging waste disposal
Competent authority: IHK Aachen


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Examination documents (No. 2062-2018-000293) with 7 following pages

CERTIFICATE

Recyclability of Packaging

The company receives the certification of recyclability for the following packaging.

Designation

earthcoated CUP (beverage cup, ca. 300 ml)

Test result

Allocation to path/specification:	Mixed Waste Paper, type 5.01
Recycling path:	Mixed Waste Paper, type 5.01
Recyclate (final product):	Paper fibres

Test standard/ scope of application: Requirements and assessment catalogue of the institute cyclos-HTP (state of 03.08.2017)

In accordance with the test results and the examination documents the recyclability of the packaging amounts to:

Classification **AAA (> 95 %)**

This certificate (No. 2062-2018-000293) is valid until the **31.05.2020** (2 years upon issue) relating to the countries identified in the assessment report. This certificate will lose validity in case of qualitative or quantitative changes of packaging components.

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Examination documents (No. 2062-2018-000293) with 7 following pages

Cyclos HTP Recyclability Testing and Paper Grade Qualification

- EarthCoating is classified for processability as a clay coating under CAT 2, not a polymer coating under CAT 3
- Therefore, EarthCoating is qualified under Path 13 in the premium paper category along with clay-coated paper such as office paper

Specification

Specifications define recycling specific material properties such as purity or positive listed packaging groups. If a packaging can be assigned to an existing specification, established sorting and recycling structures can be assumed. Frequently, packaging can also be assigned to several specifications. These are then named in the order of high quality of potential recovery.

The present packaging can be assigned to the following specifications:

Mixed Waste Paper, type 5.01

Path allocation

Under path allocation, we indicate which recycling path for the packaging is to be taken into consideration. At this point in time, we distinguish between 13 different paths. The path allocation is analogous to the designation of specifications mentioned above. Individual criteria for assessing recyclability are based on the reference process listed for each path in the requirements and assessment catalog.

For the present packaging, the recyclability is determined via the following recycling path:

Path 13: Paper, Cardboard

Collection and recycling structures

Collection and recycling structures are established according to the path assignment for the following states:

European Union and Switzerland

Examination documents for Certificate No. 2062-2018-000293



Chapter 4: Comments on relevant test criteria

Categories of contaminants

With regard to the quality of contaminants, three categories are to be distinguished:

CAT 1: Materials, quantitatively separable by the treatment steps of the recycling process.

CAT 2: Materials, not separable by the treatment steps of the recycling process, having no or negligible impact on the recycle properties up to a defined relevant concentration.

CAT 3: Materials, not separable by the treatment steps of the recycling process, degrading the quality of the recycle to uselessness or otherwise lead to disproportionately high process costs.

Comments:

Percentage CAT 1: -	0,0%
Percentage CAT 2: Earth Coating, Ink, Water Based Coating, Hot Glue, Cold Glue	4,7%
Percentage CAT 3: -	0,0%

4.2 Reference scenarios including explanations

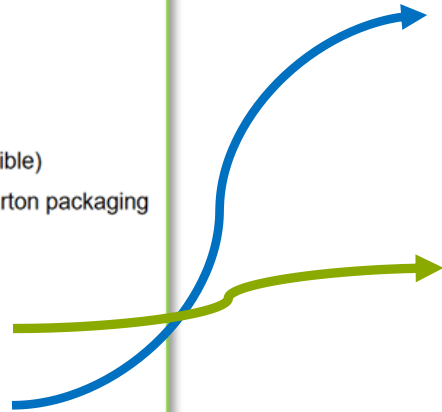
- Overview - Lightweight packaging / PMD / recyclables
- Recycling path 1: Plastic film
- Recycling paths 2 and 3: PE and PP
- Recycling path 4: PS
- Recycling path 5: PET-Bottles
- Recycling path 6: Mixed plastics (rigid) / MPO (rigid)
- Recycling path 7: Mixed plastics (flexible) / MPO (flexible)
- Recycling path 8: Beverage carton / plastic-coated carton packaging
- Recycling path 9: Tin plate / ferrous metals
- Recycling path 10: Aluminium / non-ferrous metals
- Recycling path 11: Paper and cardboard composites
- Recycling path 12: Glass
- Recycling path 13: Paper, cardboard

Corresponding categories across Cyclos HTP and Europe's PPWR

Packaging with EarthCoating has qualified under Path 13, similar to clay-coated paper with the Cyclos HTP test. Therefore, packaging with EarthCoating may also qualify under Category 3 in the PPWD Annex II

4.2 Reference scenarios including explanations

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- Recycling path 11: Paper and cardboard composites
- Recycling path 12: Glass
- Recycling path 13: Paper, cardboard



ANNEX II

CATEGORIES AND PARAMETERS FOR ASSESSMENT OF RECYCLABILITY OF PACKAGING

Table 1: Indicative list of packaging materials, types and categories referred to in Article 6

Category No	Predominant packaging material	Packaging type	Format (illustrative)	Colour
3	Paper/cardboard	Paper/cardboard packaging	Boxes, trays, grouped packaging	
4	Paper/cardboard	Composite packaging of which the majority is paper/cardboard	Including beverage cartons, plates and cups, i.e., metallised or plastic laminated paper/ card, liquid paperboard, paper/cardboard with plastic liners/ windows	

Target Markets for Packaging Applications



FOODSERVICE PACKAGING

Paper Cups
Takeout Trays



FLEXIBLE PACKAGING

Pouches, Bags
Sacks, Rewind



FOLDING CARTON

Cartons, Boxes










LABELS

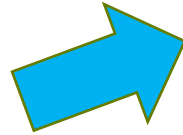
White and Rose Wines
Wet Condition Labels

Commercialization: Over 2.5 Billion packages with mineralized resins sold to date

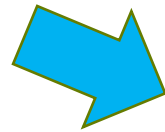
Sample of Commercialized Applications

	Hungry Jacks (Burger King Australia)	Beverage paper cups (hot and cold)	Hot and cold beverage cups in Australia and New Zealand have been made with EarthCoating, as part of Detpak's Recycle Me program, collected and recycled into gift wrap and copy paper
	United Airlines	Coffee cups	Coffee cups on United Airlines flights globally are made with EarthCoating, and branded as the Super Cup by Linstol.
	McDonalds	Flexible packaging: Pouches	Pouches for McDonald's Happy Meal Toys have been converted from plastic to paper-based, and use EarthCoating, to be a recyclable material.
	Kleenex	Flexible packaging:	Kleenex converted the packaging for their bamboo toilet paper line, from plastic wrap to paper-based packaging with EarthCoating
	Whole Foods	Foodservice Packaging: Takeout Tray	Takeout trays
	Coffee Supreme	Flexible Packaging Coffee bags	Coffee Bags
	Viva	Flexible Packaging	Viva Paper Towels converted the packaging for their bamboo paper towels, from plastic wrap to paper-based packaging with EarthCoating

Circularity in action: Australia's RecycleMe: Recycling program for Paper Cups with Mineralized Resin



Copy
Paper



Gift
Wrap



I used to be a coffee cup!

By choosing this wrapping paper, you're helping to divert takeaway cups from landfill and giving valuable cup paper fibres a chance to live again!



Copy Paper



Gift Wrap

Hallmark



Hallmark

I used to be a coffee cup!

By choosing this wrapping paper, you're helping to divert takeaway cups from landfill and giving valuable cup paper fibres a chance to live again!



Available at:



The screenshot shows the Kmart website interface. At the top left is the Kmart logo. To its right is a search bar and navigation icons for Stores, a heart, a shopping bag, and Sign in. Below this is a horizontal menu with categories: Easter, Online Exclusives, Home & Living, Tech, Toys, Womens, Mens, Kids & Baby, Beauty, Sport & Outdoor, Clearance, and Catalogue. The breadcrumb trail reads: Home > Home & Living > Party, Cards & Wrap > Cards, Wrap, Gift Bags & Boxes > Wrap. The main product image shows a gift box wrapped in light blue paper with a botanical pattern, tied with a pink ribbon. A circular seal on the image says 'Hallmark Recycle Me COFFEE CUP'. To the right of the image, the text reads 'BACK ONLINE SOON', followed by the product title 'Hallmark RecycleMe Gift Wrap Roll - Pink Brush Stroke' with a 3-star rating and '1 Review'. The price is '\$5.00'. Below the price is an 'Add to wishlist' button. A 'Find in store' button is also present. At the bottom of the product section are two financing options: 'afterpay' (Available on orders \$70 to \$2000, with a 'Learn More' link) and 'ZIP' (Available on orders \$70 to \$1000, with a 'Learn More' link). A chat icon is in the bottom right corner.

Summary

- Mineralized resins are drop in enhancements to extrusion-coating of polymers in packaging applications
- With a simple change to the pellet, all manufacturing processes, equipment and speed are maintained or improved plus:
 - Less plastic
 - Improved barrier performance
 - Lower cost
 - Improved recyclability





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You must be the change
you wish to see in the world.

~ Mahatma Gandhi

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