POLYMATE Ltd.
International Nanotechnology Research Center

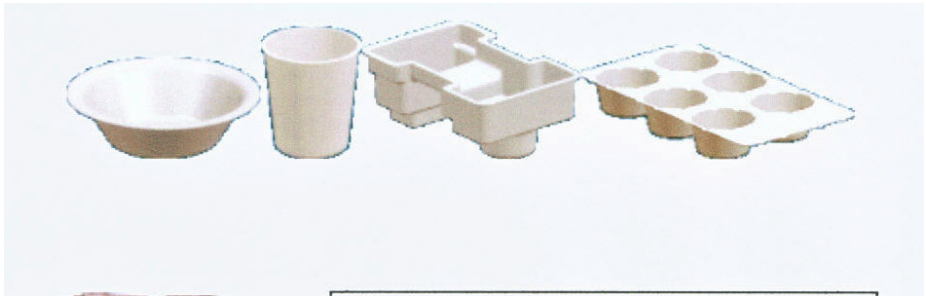
BIODEGRADABLE AND RECYCLABLE HYDROPHOBIC COATINGS (GreenCoat)

GreenCoat is a new hydrophobic, strong, inexpensive, and completely biodegradable environmentally friendly nano-coating.

GreenCoat greatly improves the properties of paper and cardboard packaging materials. Due to its biodegradable nature.

GreenCoat is ideal for disposable loose fill bags and packages. The materials can be used as a commodity in trade, industry and agriculture for a wide range of applications. To date, most attempts to produce biodegradable products for consumers focused on developing biodegradable plastics have not been economically successful.

GreenCoat approaches biodegradable products from the other direction – making a treatment material with the same barrier properties as plastic, except that the treated material biodegrades completely in the same time as untreated paper bags.



Applications

The number of potential applications for **GreenCoat** is immense. Because **GreenCoat** can be applied on cellulose-based sheets, films and fibers, it is suitable for a range of single-use products including grocery and waste bags, the top and back sheets of disposable diapers, disposable paper plates, cups and eating utensils. It can be used to create agricultural films and bags that cover ripening fruits, films for food packaging and miscellaneous everyday items which would include sanitary products. The possible applications are:

Some Everyday Items

Trash and grocery bags paper cups and plates, tablecloths and other household goods, leaves collection bags;

Packaging Materials

Carton boxes, disposable containers for food processing, bags for industrial products.

Agricultural Uses

Mulch pots, composing bags for agriculture waste.

Textile and other Industry Sectors

Biodegradable textile materials, synthetic leather, biodegradable membranes.

Sanitary Products

Protection layer for disposable hygienic materials like diapers, sanitary napkins, panties, towels etc.

Advantages

High strength

GreenCoat strength is measured in dry conditions and determined according to ASTM D638 and in wet conditions by ASTM D829 9 (See table below). Such strength characteristics especially combined with low elongation and water resistance of the treated material; make **GreenCoat** unique and highly efficient for packaging application due to its water, grease and oil resistance.

Recyclability

GreenCoat can be recycled along with its base material cellulose, paper, cartons. Enzymes begin breaking down **GreenCoat** in the presence of moisture in natural environments such as soil and decompose the material within rapidly-occurring metabolic reactions turning **GreenCoat** into biomass within 2-3 months in wet soil. **GreenCoat** uses reproducible natural raw materials

Relatively low cost

The main obstacle to widespread use of biodegradable polymers is cost. Biodegradable polymers are significantly more expensive ($10-$100) than commodity polymers ($2-$5). The high cost involved in the production of biodegradable polymers precludes their use as a substitute to the conventional polymers whereas **GreenCoat** has no such cost barriers. **GreenCoat** –coated material is cellulose based, so it can be manufactured with existing paper and pulp industry equipment using existing technologies. This means that it is only insignificantly more expensive to produce than to produce paper itself. Currently available degradable materials, on the other hand, can cost twice as much.

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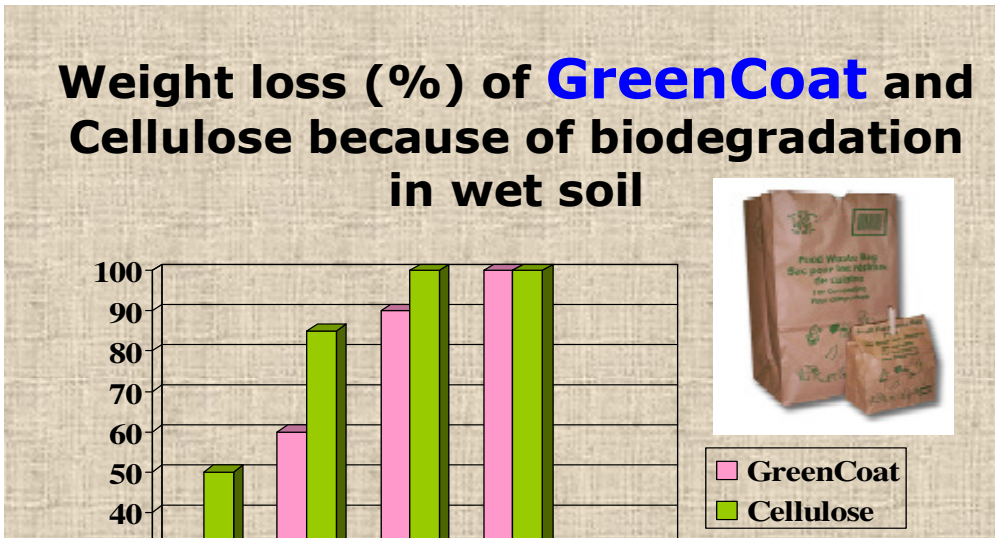

Specifications

GreenCoat is a new specially developed coating providing increase of strength and water resistance of ordinary paper substrates keeping thus its ability to biological decomposition..

GreenCoat is a hydrophobic, strong, inexpensive and fully biodegradable material. Product properties are diverse and customizable, but generally mimic both polyethylene and paper products. The table below contains a summary of properties of experimental samples of **GreenCoat** and a comparison of the results to other packaging materials.

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GreenCoat comparative table

Properties	Materials			
	LDPE	**Bioceta**	**Materi-Bi-(Z)**	**GreenCoat**
Producer	Borealis A/S, Denmark	Mazucchelli 1849 S.p.A., Italy	Novamont S.p.A., Italy	**Polymare Ltd., Israel**
Tensile strength, kg/mm^2				
- dry conditions	2-3	3-4	2-3	**4.5-6**
- wet conditions	1.9-3	2.3-3.2	1.4-2.3	**3.4-5.5**
Water vapors transmission rate, 23 ^{o}C, 85% R.H., g · μm/(m^2·d)	100-300	500-600	4000-5000	**100-400**
Oxygen transmission rate, 23 ^{o}C, OTR · 10^{-4}, (cm^3 ·μm)/(m^2 ·d· bar)	8.6-17.2	4.3-6.1	4.3-6.9	**1.7-3.5**
Rate of biodegradation, %, in wet soil (25-30% of moisture, 28-30 ^{o}C) for 6 months	0-0.5	20-30	100	**100**
Time of biodegradation in wet soil	> 10 years	1 year	1-2 months	**1-2 months**