



Case Study – Packaging Material & Partner Recommendations To Food & Beverage Company

Value Delivered – Client used GreyB’s analysis on materials to identify the best fit materials and further, asked GreyB to provide analysis on the companies providing such materials to partner with them.

Problem to be solved – A European company approached GreyB to help them identify biodegradable materials and companies that can help in achieving better packaging solutions. Client was inclined towards exploring better packaging solutions in global market.

Solutions offered – GreyB chalked out the features that were necessary for packaging of client’s products and then filtered the materials based various properties like moisture barrier. Thereafter, a SWOT was performed on those materials to assess it on various criteria like commercial applicability, scalability, partnership options, cost and more. GreyB also evaluated the options to address the material weakness and checked for the commercially available options to enhance the material properties for food packaging. As a result GreyB created a list of 18 materials and recommended 2 out of those for pursuing further.

MATERIALS BEING USED IN THE PACKAGING INDUSTRY

	BIO-BASED	
	<ul style="list-style-type: none"> • Polylactic Acid (PLA) 	<ul style="list-style-type: none"> • Thermoplastic Starch (TPS) • Polyhydroxyalkanoates (PHA) • Polyhydroxybutyrate (PHB) [this is a special type of PHA only] • Cellulose Acetate & derivatives (CA, CAB, CAP)
BIODEGRADABLE UNDER INDUSTRIAL		BIODEGRADABLE UNDER NORMAL CONDITIONS

SOLUTIONS TO COUNTER WEAKNESSES OF PLA

WEAKNESSES	SOLUTIONS
Low strength (fragility) and shelf-life [Source]	Total S.A. , under the name of Fina Technology Inc. has filed couple of patents that seem to counter this particular weakness of PLA - US10125249B2 and US9796842B2 - both these patents discuss a biodegradable polystyrene blend that is strong enough to be used in a wide variety of applications . Although there isn't any explicit indication that this blend is in commercial use.
PLA is degradable only under certain conditions [Source]	CJ CheilJedang Corp. , a south Korean food company has a patent US9328239B2 that talks about a biodegradable blend of PLA containing polyhydroxyalkanoates, which improves reproducible mechanical properties for the overall composition.
Poor oxygen barrier properties than petroleum-based plastics, such as polyethylene terephthalate (PET) or polystyrene (PS)	A Netherlands based company called BioFutura has developed a proprietary crystalline PLA (CPLA) material that is a combination of PLA (70-80%) and chalk (20-30%) and other biodegradable additives. According to the EN-13432 composting standard, CPLA products are 100% biodegradable and compostable - i.e. in an industrial composting facility under optimum conditions (oxygen, moisture and heat), this PLA will be fully composted in 8-12 weeks .
	There is a research paper by Carosio et al. [Source] , which discusses a layer-by-layer deposition technique on commercially used PLA.

butyrateadipate Terephthalate (PET)
glycolic acid (PGA)
caprolactone (PCL)

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • The most researched biodegradable alternative in the packaging industry. • Being derived from plants, PLA is completely bio based i.e. the original materials are renewable [Source] • Low manufacturing costs [Source] • Good moisture barrier properties comparable to those of petroleum-based plastics, such as polyethylene terephthalate (PET) or polystyrene (PS) [Source] 	<ul style="list-style-type: none"> • PLA is degradable only under certain conditions [Source] • Slow degradation rate [Source] • Low strength (fragility) and shelf-life [Source] • Poor oxygen barrier properties than PET or PS [Source] • PLA has a glass transition of about (57 °C) and so it is rigid and quite brittle at room temperature [Source]. This disadvantage significantly limits the application of PLA in ductile products.

PLA SWOT Matrix

OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Already being commercially used to build food packaging [Source] • Expected to show good growth owing to its application in different packaging applications • Some cellulose based blends of PLA are also in research phase [Source] 	<ul style="list-style-type: none"> • If there is no proper environment for composting, PLA can create methane, which is an environment hazard [Source]