

SKC Bio-Degradable PLA Film

Enriching peoples' lives through high-function materials,
Committing to customers' joy through advanced materials,
SKC will become a sustainable specialty in the world.



Best



Technology



Communication



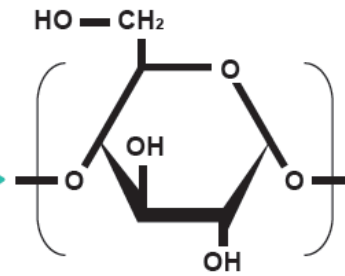
Continuance
possibility



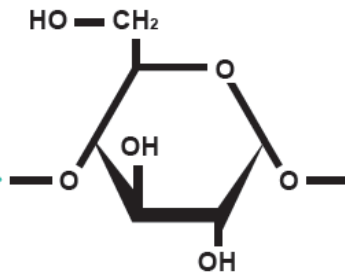


SKC PLA film is an environmental-friendly product that can be bio-degradable by using PLA(Poly Lactic Acid) resin.

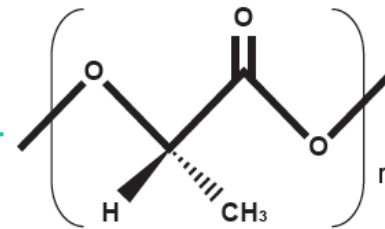
Feedstocks for Starch



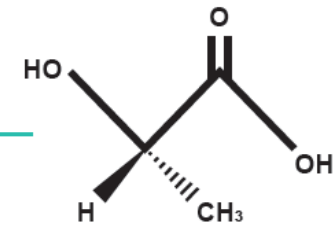
Starch



Dextrose



PLA



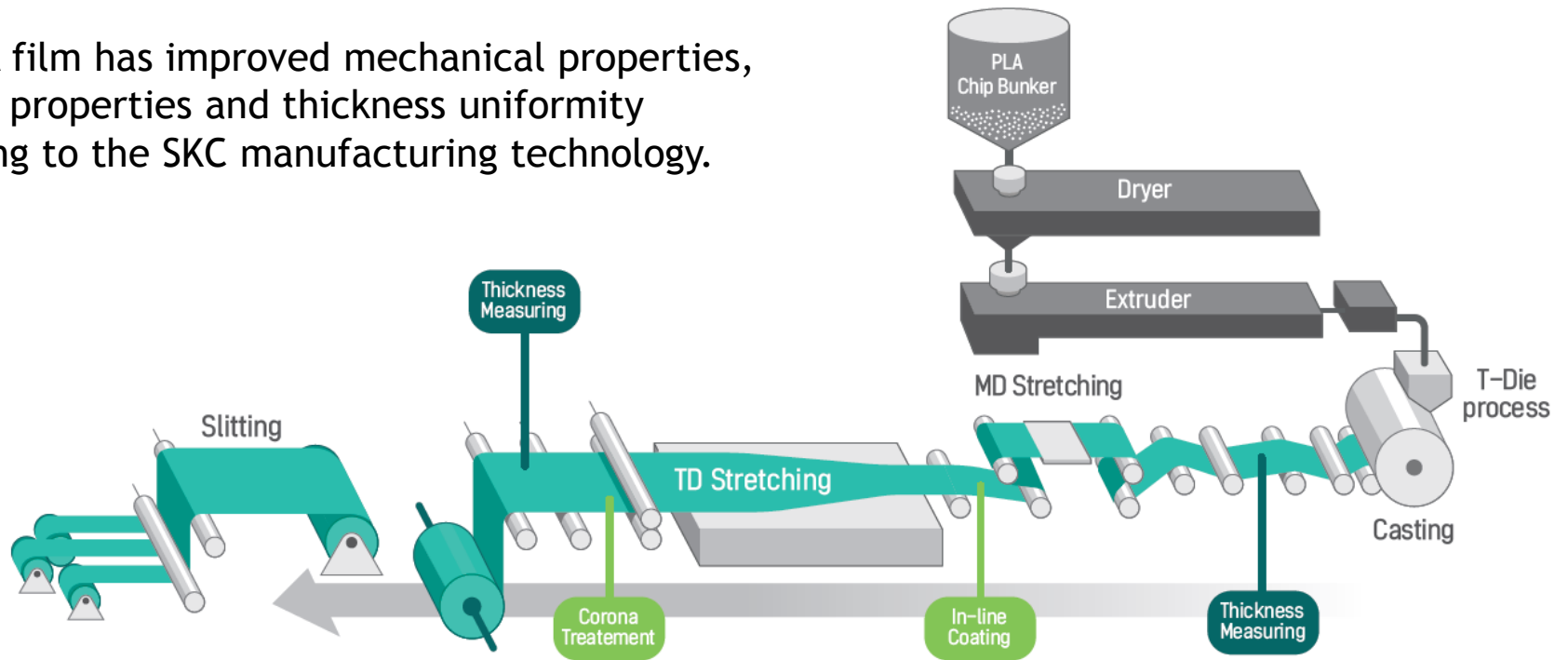
Lactic Acid



Bi-axially oriented technology

Only PLA is used,
except for a small amount of inorganic additives. (<1%)

SKC PLA film has improved mechanical properties,
thermal properties and thickness uniformity
according to the SKC manufacturing technology.



Bi-axially Oriented Film Manufacturing Process

Eco-Friendly

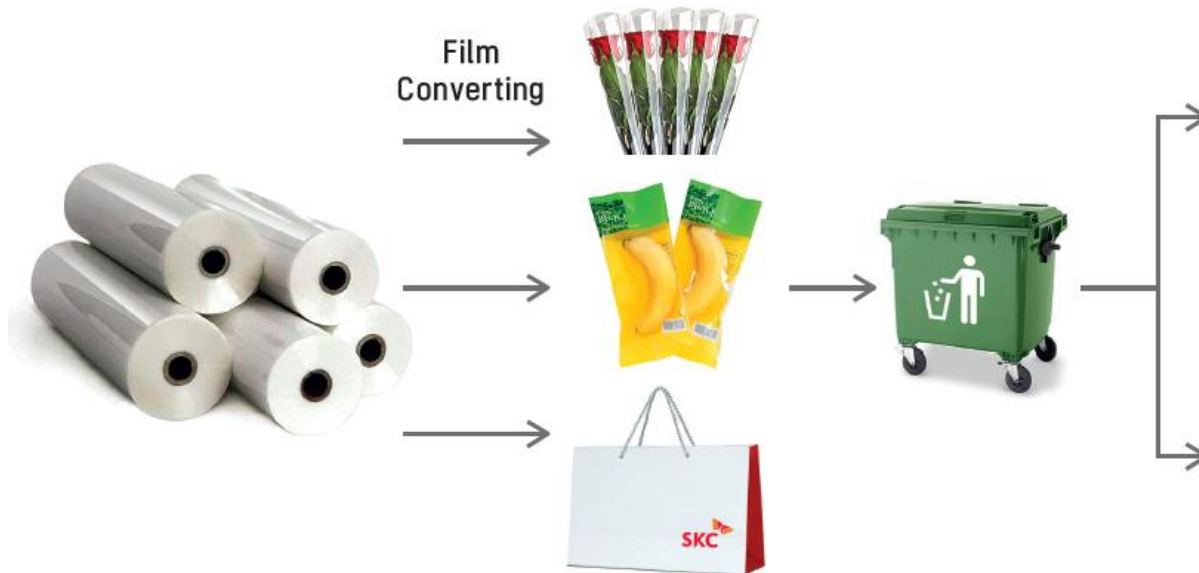
- ◆ Natural bio-mass
- ◆ Plastic pollution prevention
(Fully bio-degradable)
- ◆ GHG reduction

Functional

- ◆ Converting benefits
 - Excellent mechanical property
 - Good heat stability
- ◆ Superior optical properties



Biodegradable Plastic Film



Petroleum Plastic Film

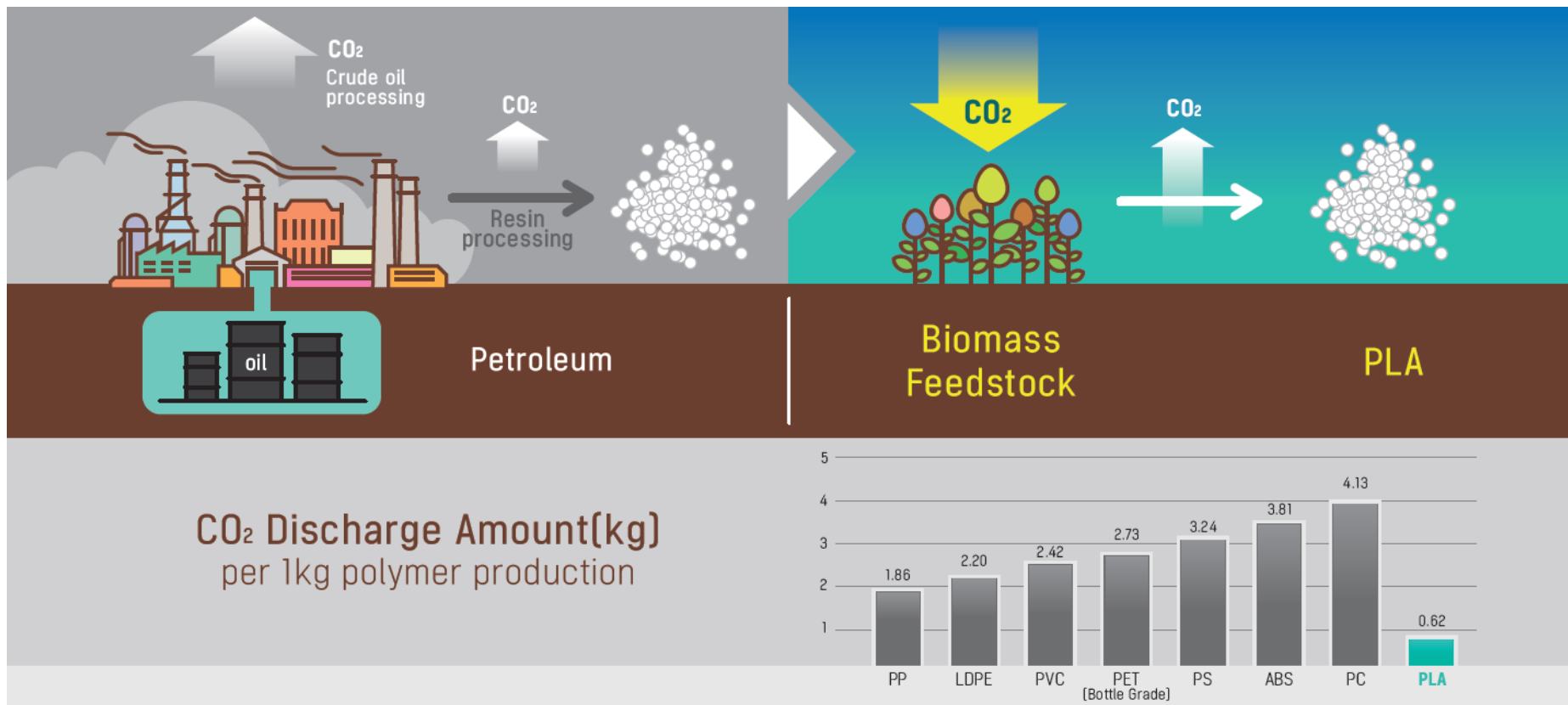


SKC PLA Film



PLA biodegradation results are CO_2 , water and soil nutrient. [Compost condition]

GHG Reduction



Source : Natureworks, PlasticsEurope, American Chemistry Council

Biodegradability

The end result of PLA biodegradation is carbon dioxide, water and soil nutrient.

This biodegradation process is temperature and humidity dependent.



- ◆ In Atmosphere
 - 5~10 years
- ◆ In Water & Soil
 - 2~3 years
- ◆ In Landfill (Semi-aerobic)
 - 6~12 months
- ◆ In Compost ($58 \pm 2^\circ\text{C}$, $>50\%$ RH, Aerobic)
 - 6~14 weeks

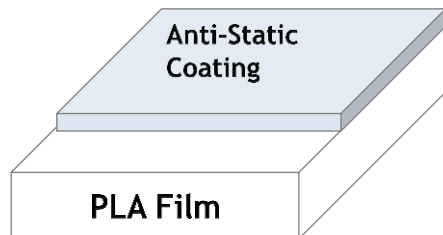


Thermo-Hygrostat (60°C , 80%RH, 100days)

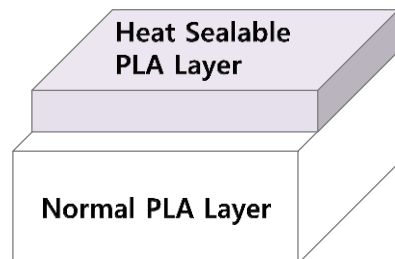
- **ISO 9001**
- **Environment Statement**
 - Environment Mark (Ministry of Environment in S Korea)
 - Biodegradability (KS M 3100-1:2003, 『KTR』 in S Korea)
 - DIN Certco - Industrial Compost (DIN EN 13432:2000-12)
- **Food Safety Statement**
 - Food Safety Examination : Pass (『KCL』 in S Korea)
 - FDA Certification : Pass (21CFR177.1520D)
 - EC Certification : Pass (No 10/2011, No 1935/2004)



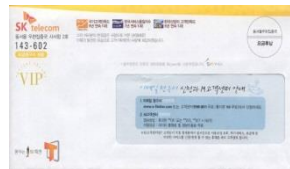
Product & Application



BC11C
Clear Mono-layer
(Corona/Anti-static)



TE90
Clear 2-layer
(Heat sealable)



Window
for
Envelop



Paper
Lamination



Glitter
(Metallization)



Fruit



Vegetable



Cake



Sandwich



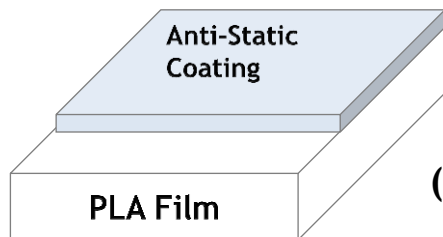
Macaron



Muffin

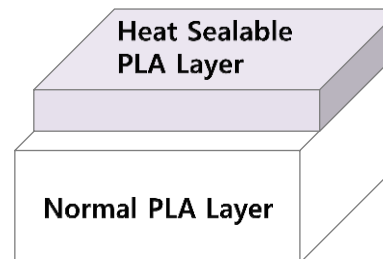
Fresh Food Flexible Package
(Short shelf life food)

Technical Data Sheet



BC11C
Clear Mono-layer
(Corona/Anti-static)

Property	Unit		Value
Nominal Thickness	μm		25
	gauge		100
Density	g/cm^3		1.25
Tensile Strength	kg/mm^2	MD	17
		TD	23
Elongation at Break	%	MD	160
		TD	110
Friction Coefficient	μk		0.36
	μs		0.40
Surface Resistance	Ω/\square	Coated side	$<10^{10}$
Biocompostability Index	%		106.5
Haze	%		2.5
Light Transmission	%		95
Heat Shrinkage	%	MD	3.0
		TD	2.0



TE90
Clear 2-layer
(Heat sealable)

Property	Unit		Value
Nominal Thickness	μm		25
	gauge		100
Density	g/cm^3		1.25
Tensile Strength	kg/mm^2	MD	15
		TD	22
Elongation at Break	%	MD	170
		TD	100
Friction Coefficient	μk		0.57
	μs		0.63
Heat Seal Temperature	$^{\circ}\text{C}$	Sealable side	80~120
Biocompostability Index	%		106.5
Haze	%		2.2
Light Transmission	%		95
Heat Shrinkage	%	MD	4.0
		TD	3.0

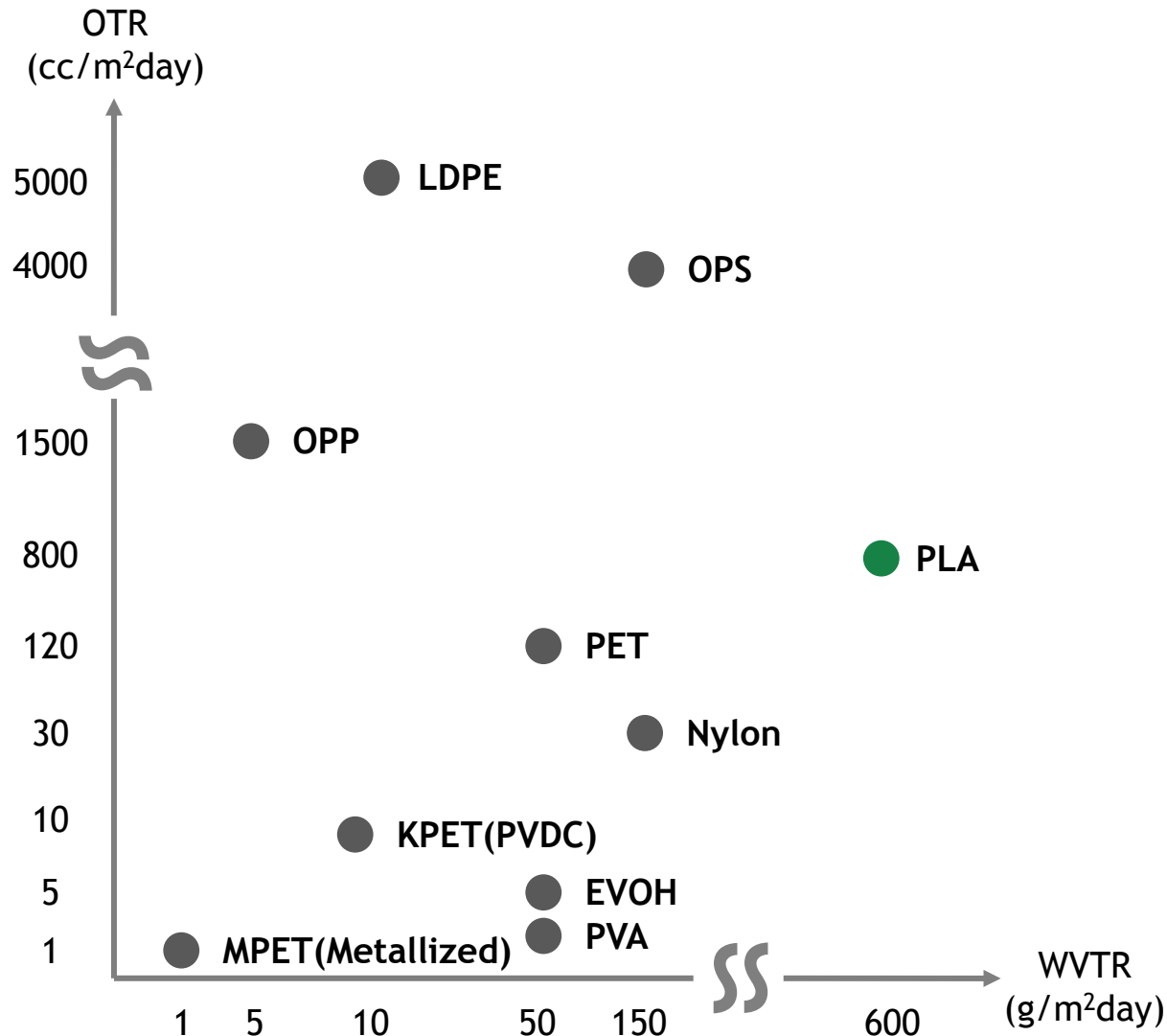
- **Starting temperature of thermal deformation** : 80℃ (Film is deformed without tension)
- **Recommended drying temperature** : 80~90℃ (Film shrinkage and wrinkling at high temp.)
- **Initial temperature of heat-sealable layer** : 80~90℃
- **T-die extrusion lamination** : Not recommended
- **Suitable adhesive for dry lamination** : Various adhesives available
- **Die cutting property** : Similar to PET
- **Printability** : Similar to PET (Surface tension is lower, 38~40 dyne/cm)
- **Surface treatment** : Corona and primer(Anti-static, adhesion promoter) available

Appendix : Solvent Resistance

Solvent	Solvent Resistance	
DI Water		Good
DCM(Dichloromethane)		Poor
DMF(Dimethylformamide)		Poor
Heptane		Moderate
Ethanol		Moderate
IPA(Isopropyl Alcohol)		Good
MIBK(Methyl isobutyl ketone) 2%		Good
Octanol		Moderate
THF(Tetrahydrofuran)		Poor
Toluene 2%		Moderate
Acetone		Poor
Ammonia		Poor
Hydrogen Chloride 37%		Good
Sulfuric Acid		Poor
Acetic Acid		Poor

Appendix : Barrier Property

Characteristics of PLA barrier property are high WVTR and low OTR than olefins.

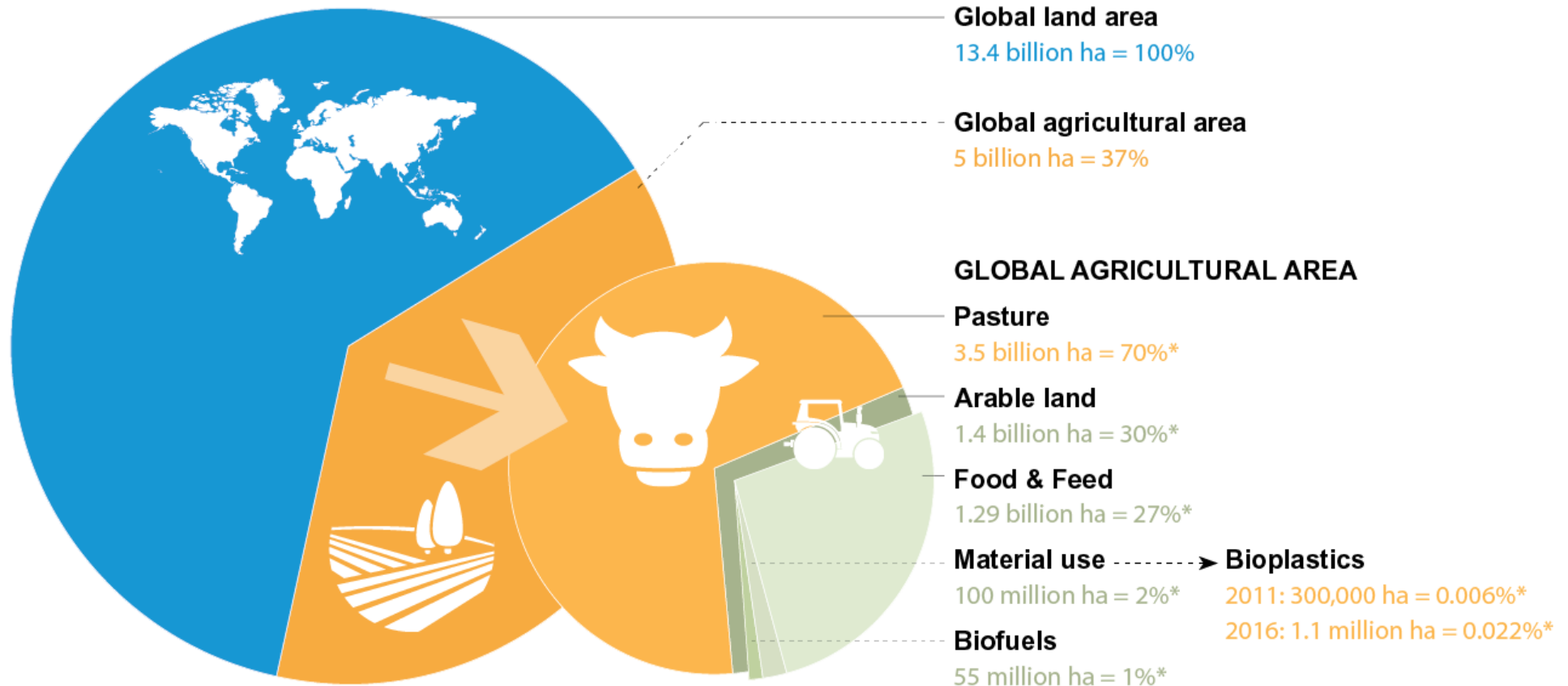


Film Type	OTR	WVTR
PLA	800	600
LDPE	5000	10
OPP	1500	5
OPS	4000	150
PET	120	50
Nylon	30	150
EVOH	5	50
PVA	3	50
KPET(PVDC)	10	10
MPET(Metallized)	1	1
Al Foil	0	0

Appendix : Typical Property Comparison

Property	Unit		Value			
			SKC PLA Film		Comparison Polymer	
			Normal	Heat Sealable	OPP	LDPE (Blown Film)
Nominal Thickness	μm		25	25	25	25
Density	g/cm^3		1.25	1.25	0.9	0.92
Tensile Strength	kg/mm^2	MD	17	15	15	5
		TD	23	22	32	4
Elongation at Break	%	MD	160	170	150	430
		TD	110	100	50	580
Tear Strength (Elmendorf)	g	MD	30	30	50	300
Young's Modulus	kg/mm^2	MD	450	440	250	30
Friction Coefficient	μk		0.36	0.57	0.3	0.3
	μs		0.40	0.63	0.3	0.3
Seal Strength	$\text{g/15mm (100}^\circ\text{C, 40psi, 0.5s)}$		X	>200	>200	>200
Biocompostability	-		Fully	Fully	X	X
Haze	%		2.5	2.2	2.0	5.5
Light Transmission	%		95	95	93	91
Heat Shrinkage	$\text{\% (100}^\circ\text{C, 5min)}$	MD	3.0	4.0	3.0	15
		TD	2.0	3.0	1.0	14

Appendix : Land Use for Bioplastics



Source: European Bioplastics | Institute for Bioplastics and Biocomposites (October 2012) / FAO

Source : Natureworks

