

The background of the slide is a warm, orange-toned image showing a pair of hands cupping a globe. The globe is depicted with a wireframe grid overlaying a map of the world. The scene is backlit by a bright light source, creating a soft glow and lens flare effects.

FILMS PLÁSTICOS COMPOSTABLES PARA ENVASES:

una estrategia complementaria al reciclado

ISMAC, 2024
ITA; Zaragoza- 19NOV 2024

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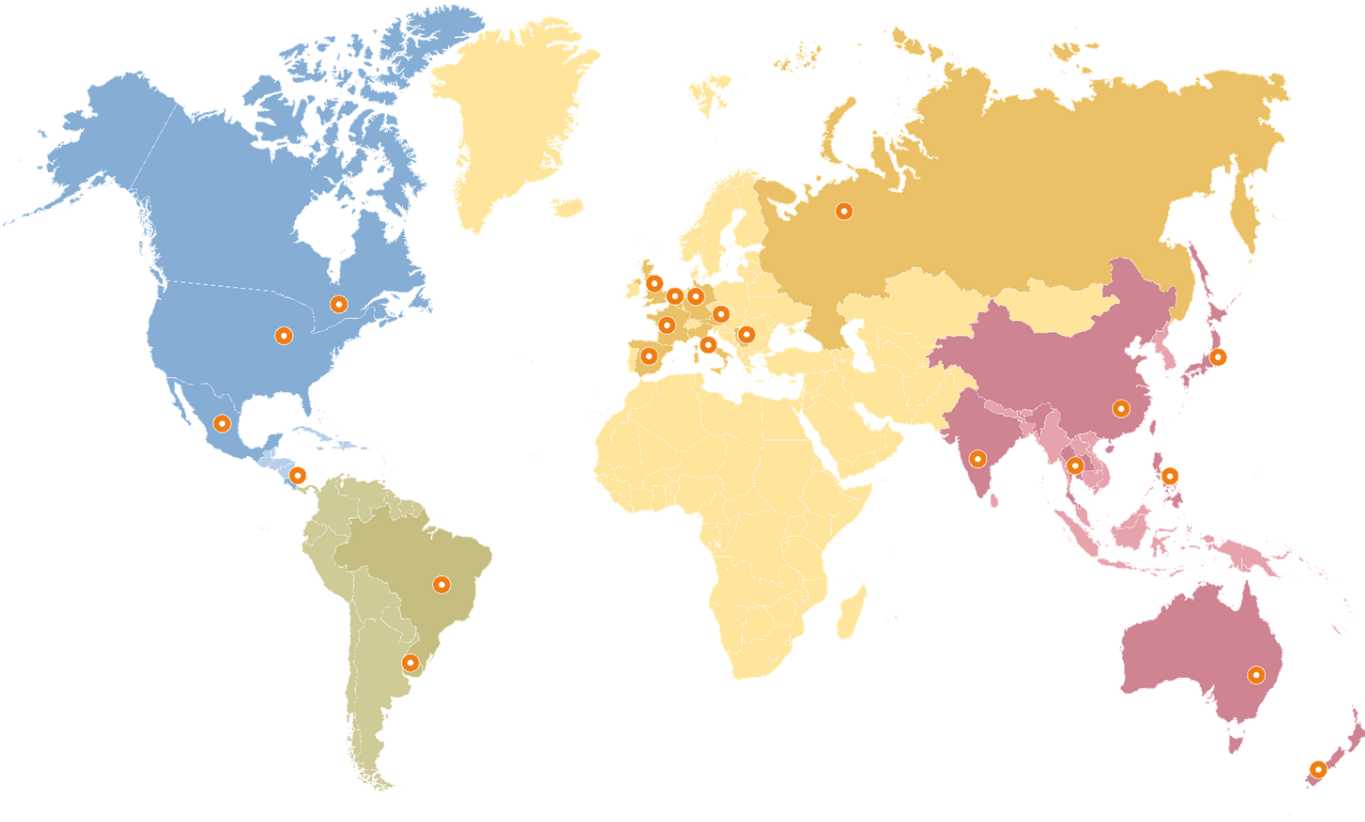
El Grupo Viscofan

Fundado en 1975, el Grupo Viscofan es líder mundial en la fabricación y distribución de envolturas para la industria cárnica. Es la única que dispone de todas las tecnologías principales: celulosa, colágeno, fibrosa y plástico.

Innovación tecnológica, calidad de producto y servicio al cliente son nuestros motores principales.



OUR GLOBAL LEADERSHIP MAKES US “THE CASING COMPANY”



19

own
production
plants



+100

countries with
commercial presence



1986

Viscofan has been
listed on the Spanish
Stock Market since
December 1986



+2,000

clients around the
world trust us



+5,300

employees



+13,500

product references

CORE BUSSINES: THE WIDEST RANGE OF PRODUCTS OF MARKET



Cellulose



Fibrous



Plastics



Specialties



Edible
Collagen



Large Caliber
Collagen



Coffi-Coffinet



Vegetal

VISCOFAN
THE GLOBAL
LEADER

DIVERSIFICATION IS THE KEY OF EVOLUTION

Protect - Take Care - Welfare

Towards new bio-applications of our materials and new businesses

BIOMEDICINE

NUTRACEUTICALS

NEW MATERIALS

BIOPACKAGING

Others

Diversification



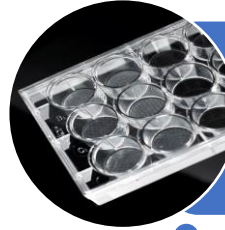
DIVERSIFICATION STRATEGY

Wellness

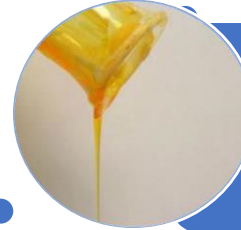
Health

Sustainable

Natural



to reach new casings
and new markets
(health, food...)



Through new raw
materials, products
and uses

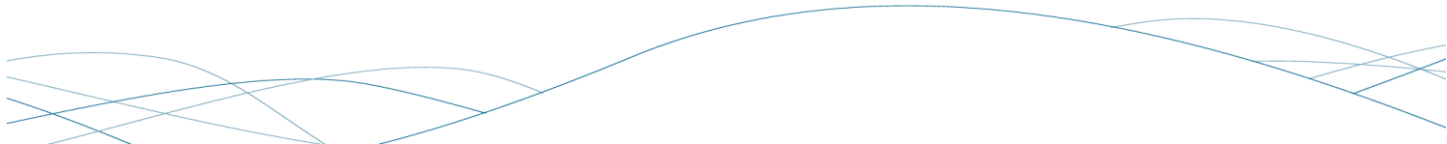


Our starting point:
Raw materials, technology and
casings

Wellness

COLLAGEN HYDROLYSATE DIETARY SUPPLEMENT

VISCOFAN
COLLInstant®
PREMIUM COLLAGEN HYDROLYSATE



Wellness

Viscofan

VISCOFAN
SatisCOOL



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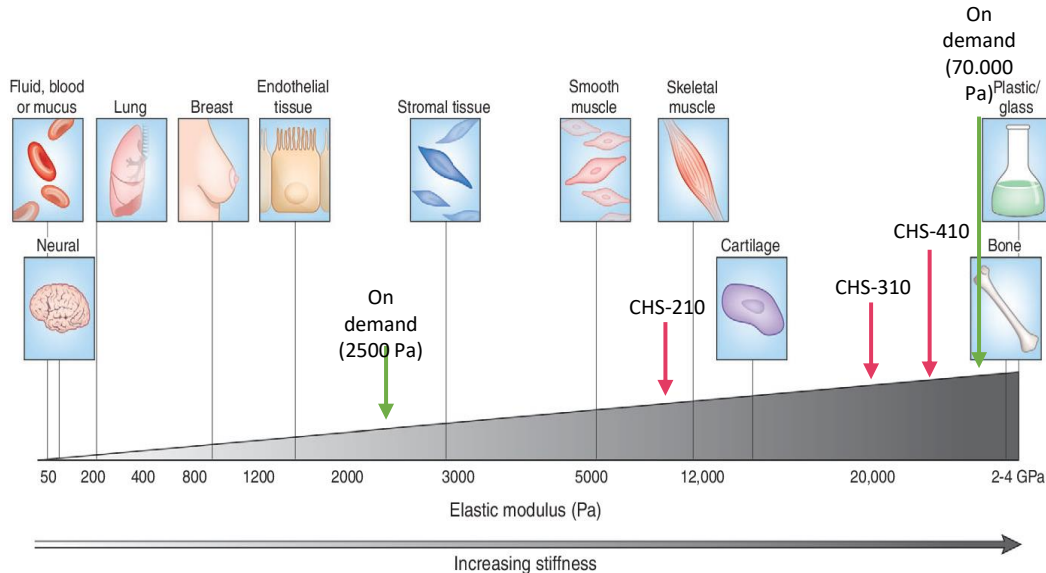
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BIOMEDICINE APPLICATIONS COLLAGEN HYDROGELS

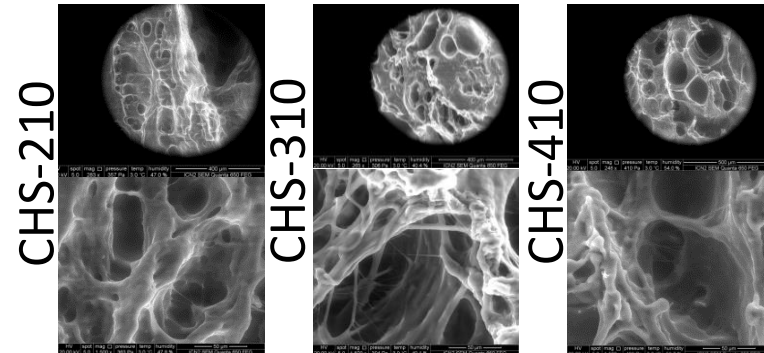
Collagen hydrogels are scaffolds with around **2 mm thickness**, made of **pure collagen** type I fibers from bovine dermis without treatment with chemical crosslinkers.

Three different stiffness are offered, based on the consistency the cell culture needs (regarding the body tissue objective to reproduce).



2 mm thickness	Between 10.000 – 30.000 Pa
Product specifications	
12 months shelf-life (-20°C)	Neutral pH

ESEM Pictures of the CHS internal structure (50-40% humidity)



BIOMEDICINE APPLICATIONS COLLAGEN SPONGE



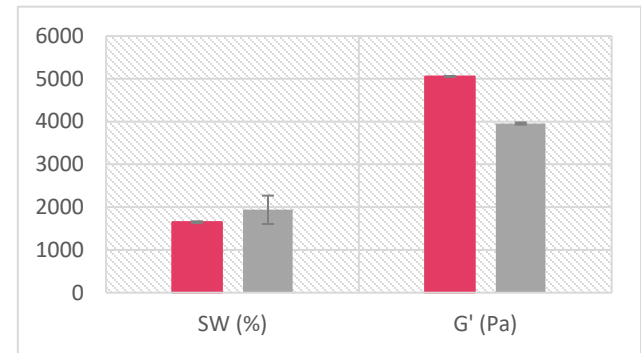
APPLICATIONS

The collagen sponge is a universal 3D scaffold for cell cultures, e.g.:

- ✓ Complex three-dimensional cell cultures
- ✓ R&D in tissue engineering & regenerative medicine
- ✓ Cell implantation studies
- ✓ Cell based assays (e.g. drug metabolism)

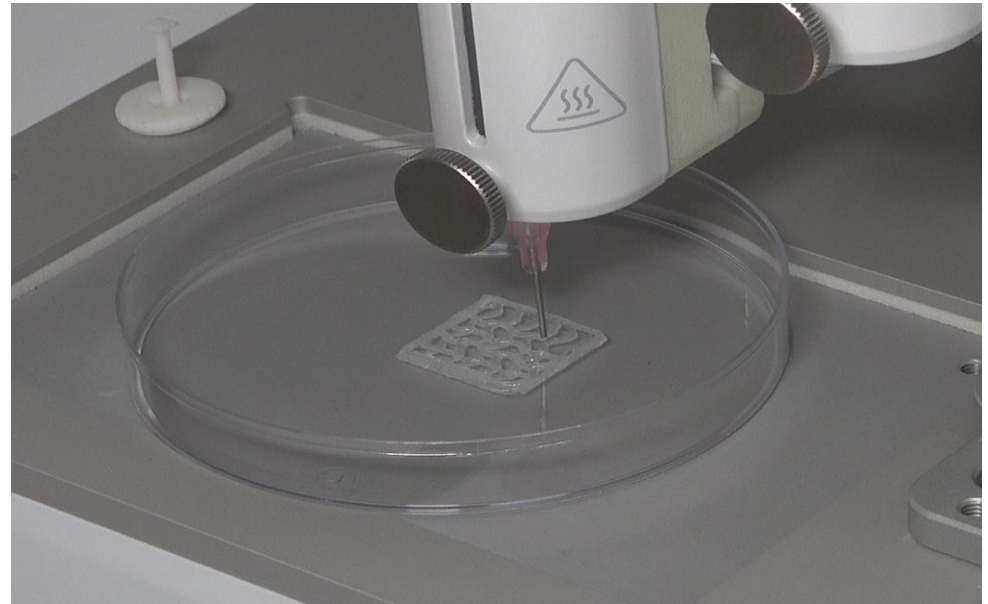
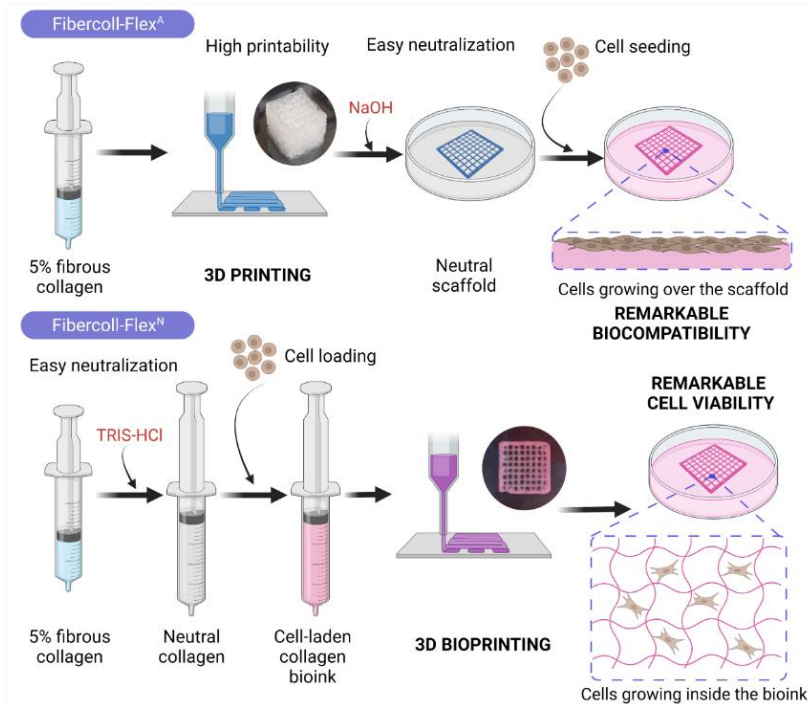
BENEFITS

- ✓ **Native type I collagen fibers** provide natural signals for cells
- ✓ No crosslinking treatment to ensure highest **biocompatibility *in vitro* & *in vivo***
- ✓ Pure and intact collagen fibers create **firm and flexible 3D scaffold** that can be easily handled in dry & wet conditions.
- ✓ Porous structure with long-term stability enables **cell migration** as well as nutrient and factor ex-change, optimizing cell performance
- ✓ Externally validated for culture of **cell lines and primary cells**



Evolution of the mechanical properties after 7 days in culture media (DMEM).
(In pink: values of SW and Elastic Modulus after 24h; in grey: values of SW and Elastic Modulus after 7 days)

BIOMEDICINE APPLICATIONS: **BIO INKS** (Collagen)



BIOMEDICINE APPLICATIONS: **Scaffolds (Collagen)**

Which collagen do you need for your biomedical R&D?



Collagen Cell
Carrier® (CCC)



Fibercoll-Flex®
bioinks



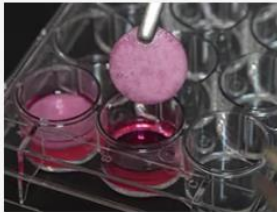
Collagen
Bio Tubes



Soluble
Collagen



Collagen
Hydrogels



Collagen
Sponges



Viscolma®
collagen
suspension



Collagen
Gel™



Custom
tailored
membranes



Vascular
simulation
vessels



*Reshaping food and wellbeing.
For many, for long.*

FILMS PLÁSTICOS COMPOSTABLES PARA ENVASES

- **DRIVERS – MATERIALES SOSTENIBLES MEDIOA**

- **Exigencia del consumidor**
- **Distribución -> demanda consumidor y regulación**
- ***“Brand owners”* -> satisfacción demanda consumidor /distribución**
- **Legislación (EU- ej. SUP, PPWR-, EE:UU, etc.)**

- **RIESGOS Y OPORTUNIDADES:**

- **RECICLADO – PPWR OBLIGA, pero ¿suficiente?, ¿viable?**
- **Reglamento plásticos contacto con alimentos (FMC) EU 10/2011...**
- **Demanda – Oferta (Certificada y de calidad) ¿ Equilibrada?**
- **Materiales Compostables > Bio Termoplásticos Compostables**



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For many, for long.

• Estrategia VISCOFAN -Solución :

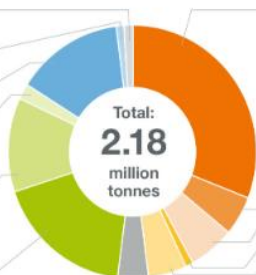
Knowhow, IP Viscofan “Hibridado”: proteínas, polisacáridos, plásticos
Proveedores materiales y tecnologías: alianzas con Viscofan
Contratos Desarrollos con Instituciones *World Class*
Inversión en Startups y SME
Licencia de patentes

VISCOFAN plástico compostable de origen vegetal

Global production capacities of bioplastics 2023

Biobased/non-biodegradable
47.9 %

Other 1.1 %
PP 0.5 %
PTT 13.5 %
PET 2.2 %
PE 12.3 %
PEF¹ 0.0 %
PA 18.3 %



Biodegradable
52.1 %

31.0 % PLA
4.8 % PHA
6.4 % SCPC
0.9 % PBS
4.6 % PBAT
4.2 % CR²

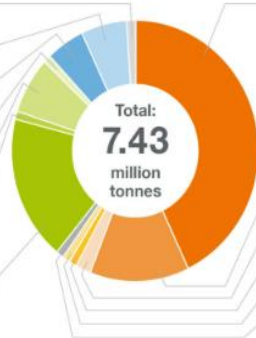
¹ PEF is currently in development and predicted to be available in commercial scale in 2024. ² regenerated cellulose films

Source: European Bioplastics, nova-institute |

Global production capacities of bioplastics 2028

Biobased/non-biodegradable
38.0 %

Other 0.4 %
PP 5.9 %
PTT 5.3 %
PET 0.4 %
PE 6.8 %
PEF¹ 0.3 %
PA 18.9 %



Biodegradable
62.0 %

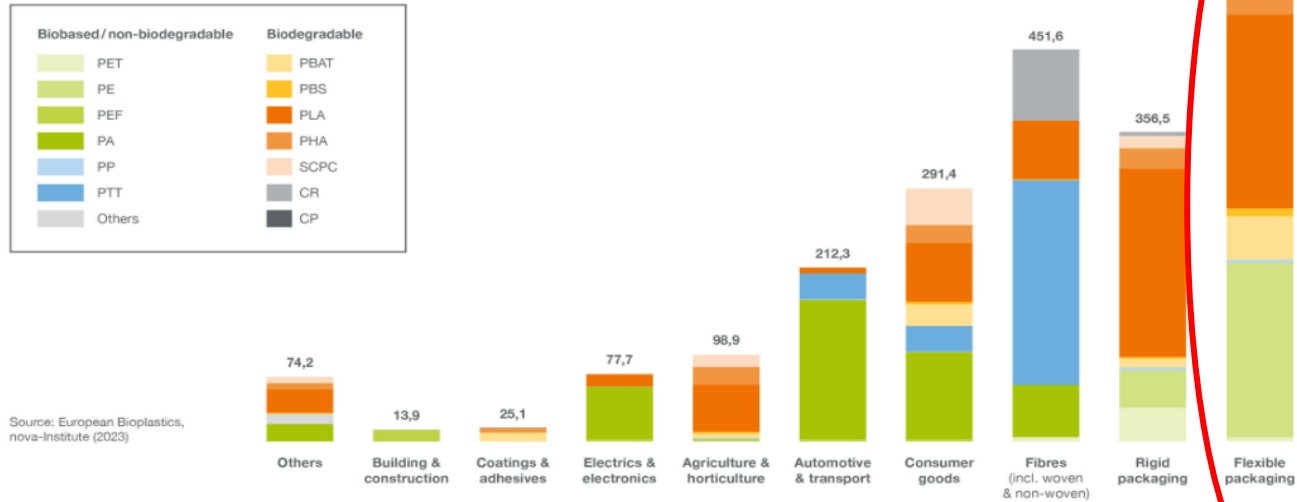
43.6 % PLA
13.5 % PHA
1.9 % SCPC
0.3 % PBS
1.3 % PBAT
1.3 % CR²

¹ PEF is currently in development and predicted to be available in commercial scale in 2024. ² regenerated cellulose films

Source: European Bioplastics, nova-institute (2023)

Global production capacities of bioplastics 2023 (market segment by polymers)

in 1,000 tonnes





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For many, for long.*

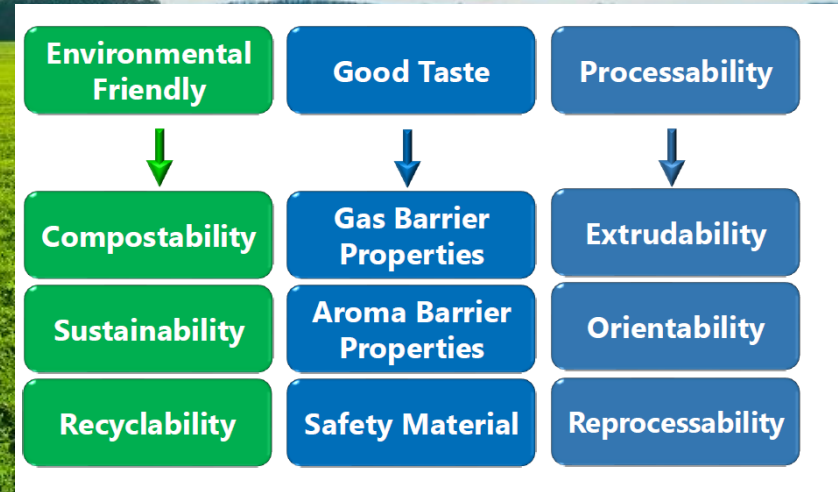
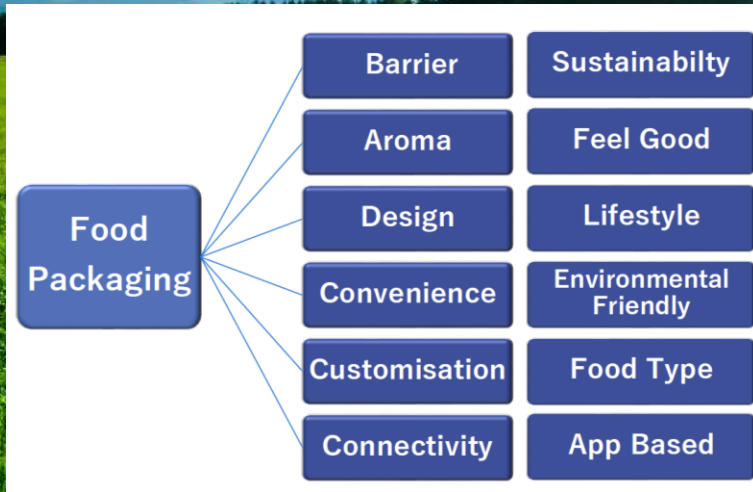
Viscofan technological capacity (Plastics)

- Co-extrusión air bubble film pilot scale line
- Twin extruder extrusion line (ZSK) pilot scale
- Internal mixer- rheometer “rheomix” (Lab)
- Co-extrusión air bubble film industrial scale lines
- Co-extrusión biaxial simultaneous , industrial scale lines
- ZSK industrial scale
- Converting (Lab, Industrial) flexo, rotogravure printing, shrink bag making
- Labs: SEM; GM-MS, HPLC, FTIR, DSC, TGA, OTR, WVTR, mechanical, etc.
- Application Product Plant- Food production and its packaging (casings)

VISCOFAN termoplastic Film Extrusion



Biodegradable Plastic – Packaging requirements



Biodegradable Plastic films playing tools

Coextrusion, lamination and coating
Melt blending and film structure design

- POLYESTERS PLA; PBTA, PHAs, PBSA, PCL others..
- MODIFIED STARCH
- FUNCTIONALIZATION POLYMERS (compatibilization, adhesion)
- POLYSACARIDES
- PROTEINS
- AGENTS CATALYZING BIODEGRADABILITY

(some) under development films at a glance

[illegible]

Biodegradable Plastics films (under development) examples

- Biodegradable films _ High oxygen barrier
- Biodegradable films - Cost effective, low barrier
- Biodegradable films - Cost effective, good WV barrier

VISCOFAN Biodegradable films with high oxygen barrier



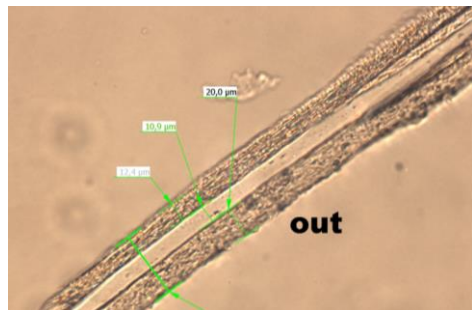
Biopolymer E Modulus sealing 1- E modulable

Functionalized (MAH_g) Biopolymer

Oxygen barrier Polymer

Functionalized (MAH_g) Biopolymer

Biopolymer E Modulus sealing 2- E modulable



WE WELCOME PROPOSALS FOR
HIGH WV BARRIER COMPOSTABLE
TEHMOPLASTIC POLYMERS!

VISCOFAN Biodegradable films with high oxygen barrier (Interim data)

			D24-15
Property	Test method	Units	Value
Thickness	Digital Micrometer	μm	40
Tensile Streght (MPa) - MD/TD	ISO 527-3	MPa	38/27
Tensile Elongation- MD/TD	ISO 527-3	%	185/100
E-Modulus	ISO 527-3	MPa	700/
Maximum Force	ISO 527-3	N	40/32
Maximum sealing strenght	width of seal= 25 mm, speed= 500 mm/min at 135°C	N	31
Oxygen transmission rate	DIN 53 380 - 23°C, 50%RH	$\text{cm}^3/\text{m}^2.\text{day}$	1
Water vapor transmission rate	DIN 53 122 - 23°C, 90/5 %RH	$\text{g}/\text{m}^2.\text{day}$	50

VISCOFAN Films Biodegradable cost effective - Low barrier



Biopolymer **Modulus E1 sealing 1**



Biopolymer **functionalized (MAH_g)**



Biopolymer **Modulus E2 sealing 2**

VISCOFAN Biodegradable Films- cost effective, Low O₂, medium WV barrier (Interim data)

			D24-13-02
Property	Test method	Units	Value
Thickness	Digital Micrometer	μm	40
Tensile Streght (MPa) - MD/TD	ISO 527-3	MPa	11-oct
Tensile Elongation- MD/TD	ISO 527-3	%	375/100
E-Modulus	ISO 527-3	MPa	300/200
Maximum Force	ISO 527-3	N	20/12
Maximum sealing strenght	width of seal= 25 mm, speed= 500 mm/min at 135°C	N	31
Oxygen transmission rate	DIN 53 380 - 23°C, 50%RH	cm ³ /m ² .day	440
Water vapor transmission rate	DIN 53 122 - 23°C, 90/5 %RH	g/m ² .day	51

VISCOFAN Films Biodegradable Cost effective - Good moisture barrier D24-12



Biopolymer **Modulus E1 sealing 1**



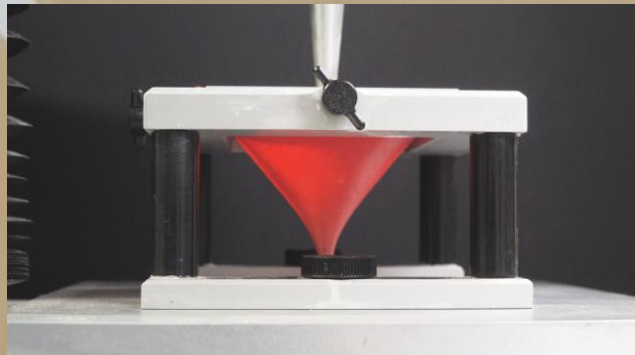
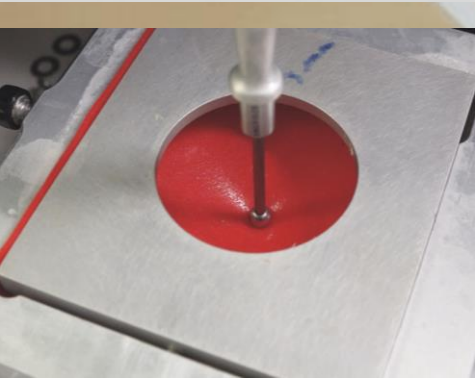
Biopolymer **functionalized and compostability boosting agent**



Biopolymer **Modulus E2 sealing 2**

Under laboratory sample evaluation

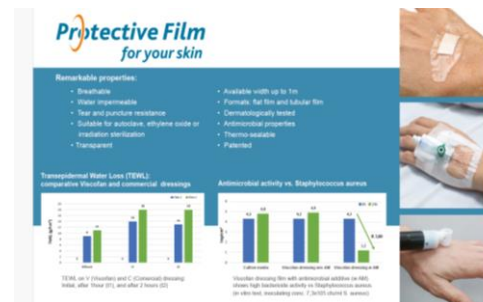
BioRubber & T-conformable Viscofan



Prospective sectors of Viscofan interest

Diversification

- Food packaging
- Non food packaging
- Medical
- Automotive
- Construction
- Agro
- No food FMCG
- Others



Thank You!

