SAES

Full involvement in Flexible Electronics

From encapsulation formulations to active barrier substrates and even organic semiconductors and high-k dielectrics, to enable the next wave of Plastic Electronics and IoT

FlexTerra OTFT Materials Platform
Truly flexible transistor technologies based on unconventional electronic materials

High Barrier Active Films for OE
Engineered plastic substrates with integrated active barrier organic/inorganic layers

H-Dry™
Polyolefin based high barrier for large area flexible panels, also with getter function

AqvaDry®
Highly engineered active filler family, integrating transparency, getter properties, flexibility

Flex Active Barriers
Very flexible active barrier sealants for bendable, foldable, stretchable devices

High Level Encapsulating Materials Features

And benefits for the device

Very Low WVTR

To minimize water permeation
10^{-6} g/m2·day?

H_2O Sorption

High capacity and optimized kinetics to sorb moisture already in the device and permeating from the external environment

Mechanical Flexibility

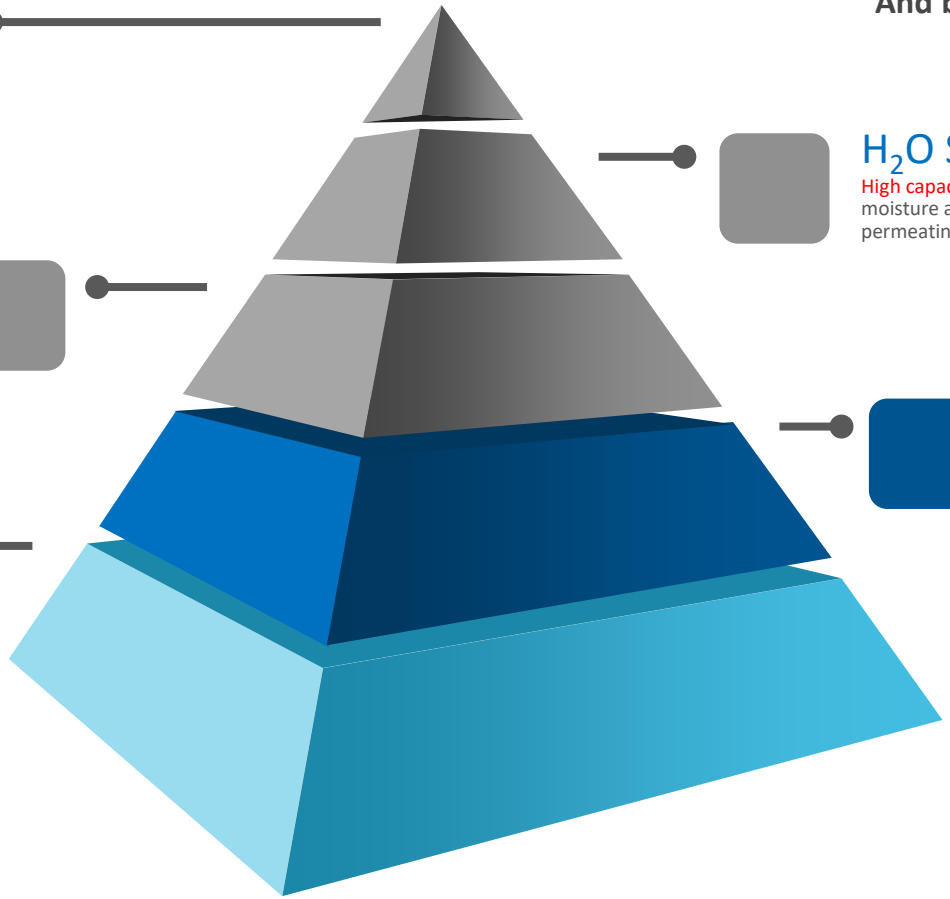
To sustain static/dynamic bending, folding, stretching without delaminating, cracking, disintegrating

Main Benefit #1

Lifetime durability guaranteed

Main Benefit #2

Full protection from tough events: extreme heat/cold, water mmersion, device stretching, drop, …



Our Functional Chemicals

Active Barriers, Fillers, Getters

Lifetime Performance

Getter effectiveness, barrier properties, physical and mechanical features of the film must be assured for many years

Accelerated Tests Reliability

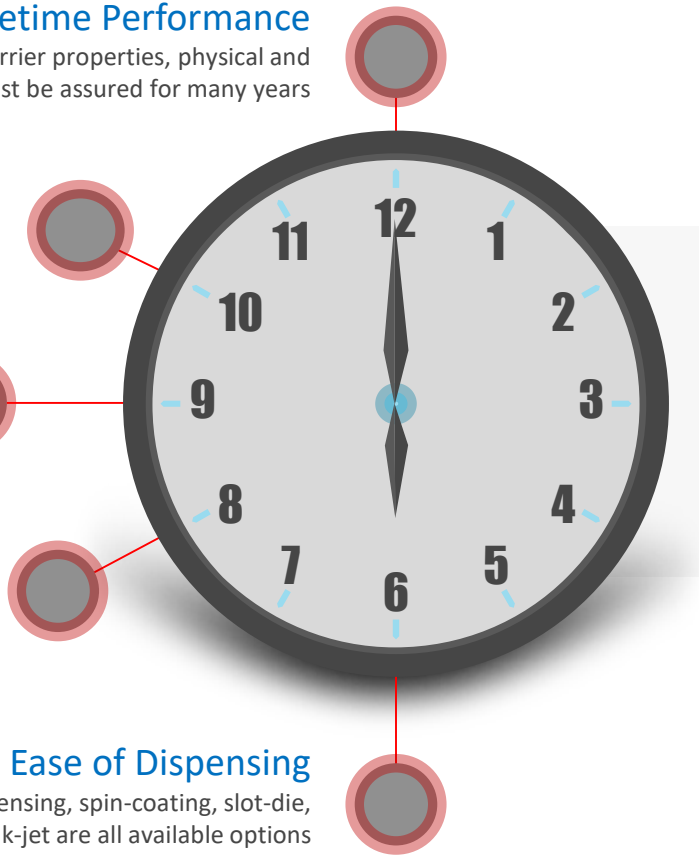
The deposited layers must always be compatible with very high temperature and RH accelerated tests

Post-Processing

UV, visible, thermal curing (or no-cure) options, to get to the final stable layer

Full Compatibility

Matching with our customers' processing tools and constraints, plus physical and chemical compatibility are always necessary



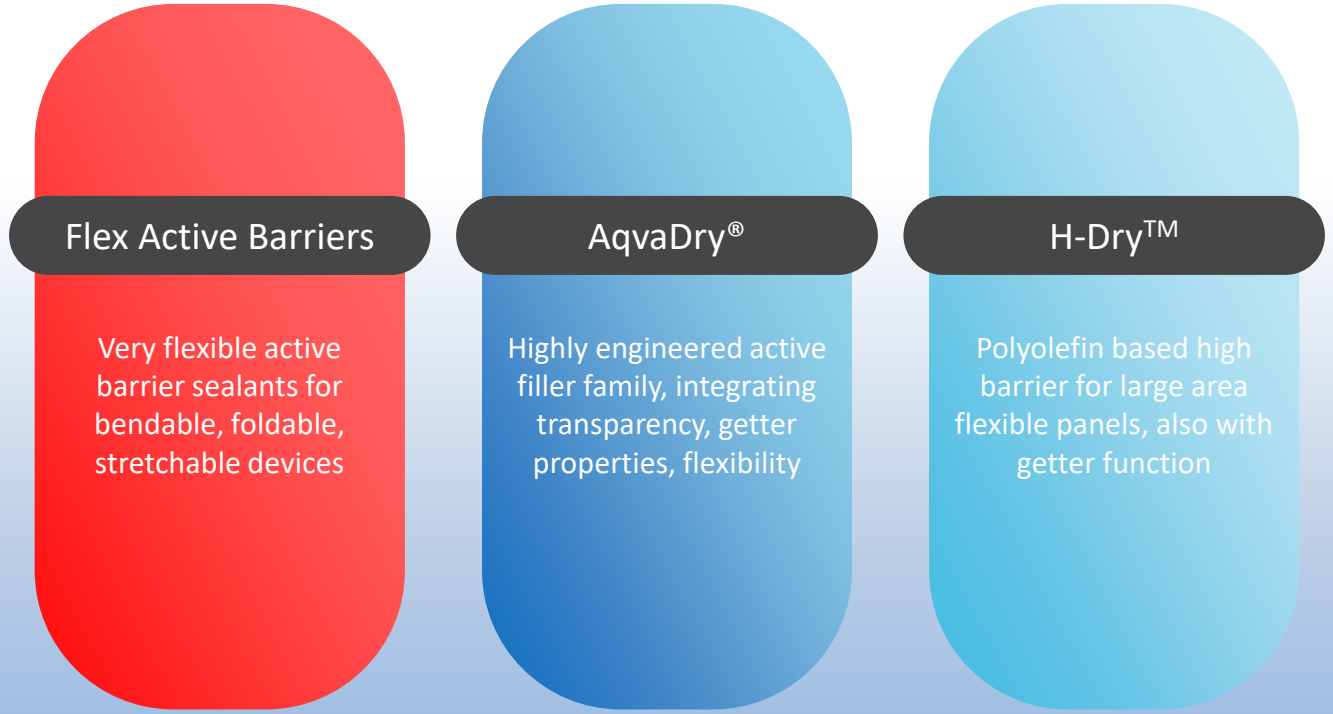
Ease of Dispensing

Needle dispensing, spin-coating, slot-die, doctor blade, ink-jet are all available options

Starting from **device manufacturing** to its **end-of-life**, our dispensable products must guarantee many **enabling** and **concurrent features**

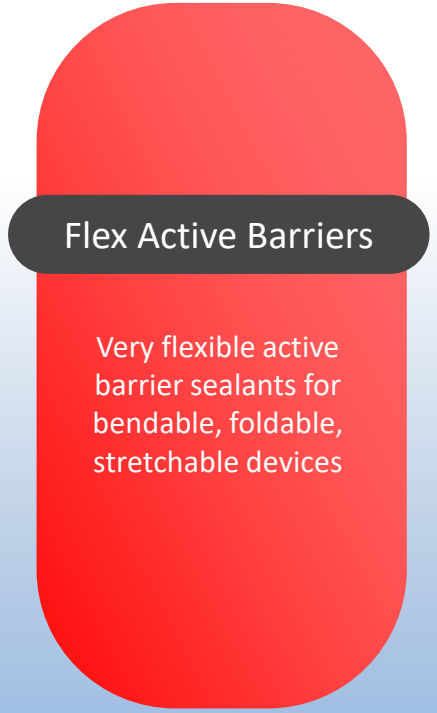
Dispensable Materials for Flex Encapsulation

Specifically designed for Flexible and Plastic Electronics applications



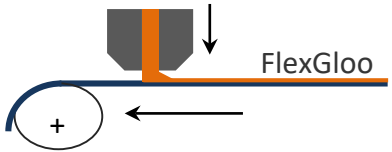
Dispensable Materials for Flex Encapsulation

Specifically designed for Flexible and Plastic Electronics applications



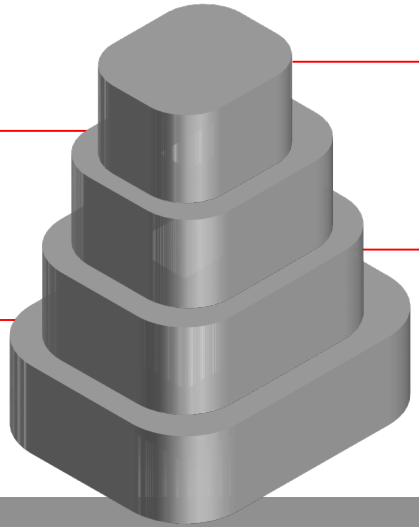
Flex Active Barriers

Monocomponent modified epoxies to stop moisture ingress



VERY STRONG ADHESION

MONO-COMPONENT SOLVENTLESS



FLEXIBILITY

HIGH BARRIER PROPERTIES

High **moisture passive barrier** properties, high **flexibility** and **moisture getter** properties (excluding the OCA version) guarantee very limited permeation and an extended breakthrough time for Plastic Electronics devices

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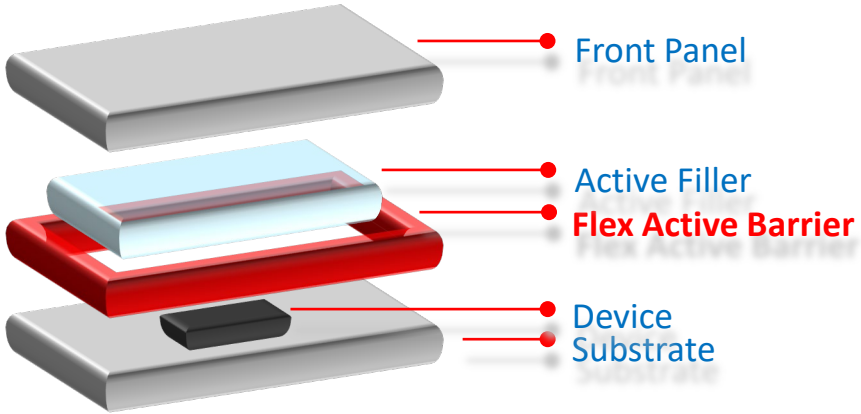
Flex Active Barriers

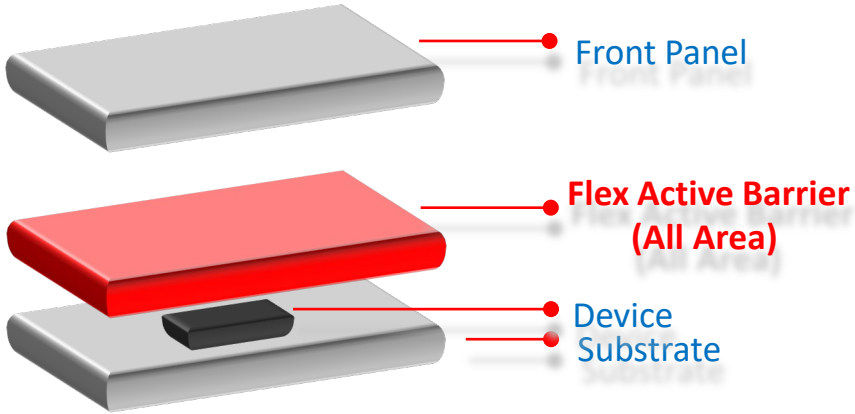
Monocomponent modified epoxies to stop moisture ingress

Flexible Dam-and-Fill



Flexible All Area

Active Barrier Sealant



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©SAES

Flex Active Barriers

Monocomponent modified epoxies to stop moisture ingress

Flex Active Barriers

Version	FlexGloo™ HC	FlexGloo™	FlexGloo™ OCA
WVTR [g/m²·day] 1mm	< 0.1 (25°C 55% RH)	< 0.1 (25°C 55% RH)	< 0.1 (25°C 55% RH)
Moisture capacity [% wt]	3.2 – 6.4	1.0	0.0
Degree of Flexibility	Bendable	Flexible / Foldable	Flexible / Foldable
Dispensability	Syringe, blading, slot die	Syringe, blading, slot die	Syringe, blading, slot die
Appearance	Whitish / Yellowish	Whitish / Yellowish	Fully Transparent
Curing	UV, VIS or Thermal	UV, VIS or Thermal	UV, VIS or Thermal

High **moisture passive barrier** properties, high **flexibility** and **moisture getter** properties (excluding the OCA version) guarantee very limited permeation and an extended breakthrough time for Plastic Electronics devices

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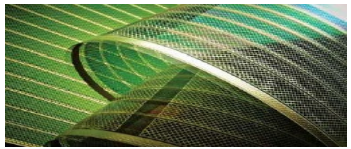
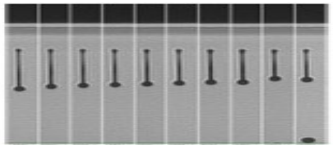
Dispensable Materials for Flex Encapsulation

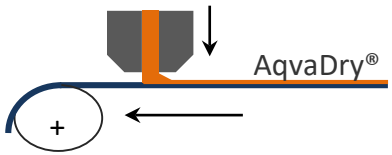
Specifically designed for Flexible and Plastic Electronics applications

AqvaDry®

Special transparent acrylics for moisture sorption and planarization layers

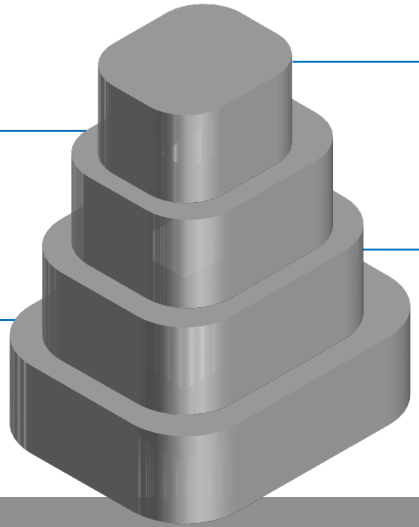






FULL TRANSPARENCY

NO PARTICLES



FLEXIBILITY

MOISTURE GETTER CAPACITY

Full **transparency**, **getter** functionality **at molecular level** (no particles) and **very high quality** of the deposited **film** make the AqvaDry family a versatile class of active fillers for flexible encapsulation and TFE

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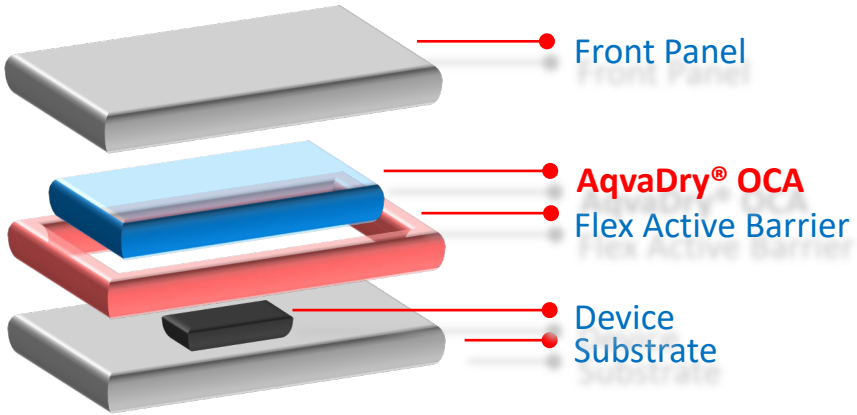
AqvaDry®

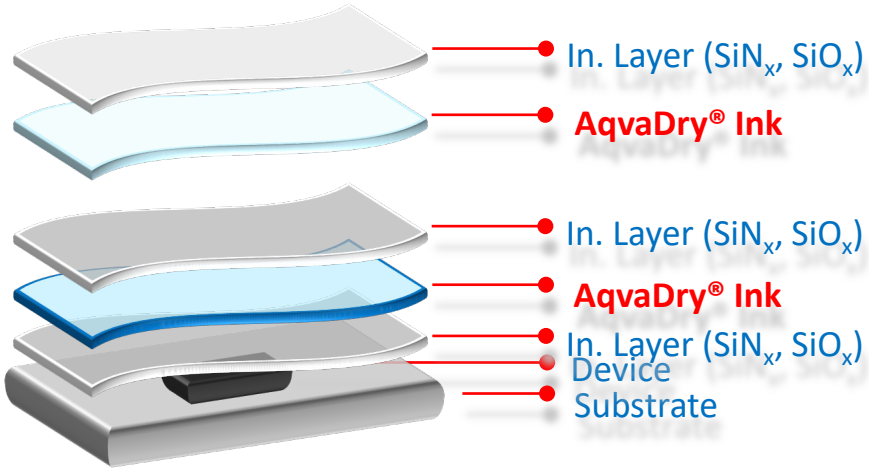
Special transparent acrylics for moisture sorption and planarization layers

Flexible Dam-and-Fill



Thin Film Encapsulation

Active Planarization Layer(s)



Full **transparency**, **getter** functionality **at molecular level** (no particles) and **very high quality** of the deposited **film** make the AqvaDry family a versatile class of active fillers for flexible encapsulation and TFE

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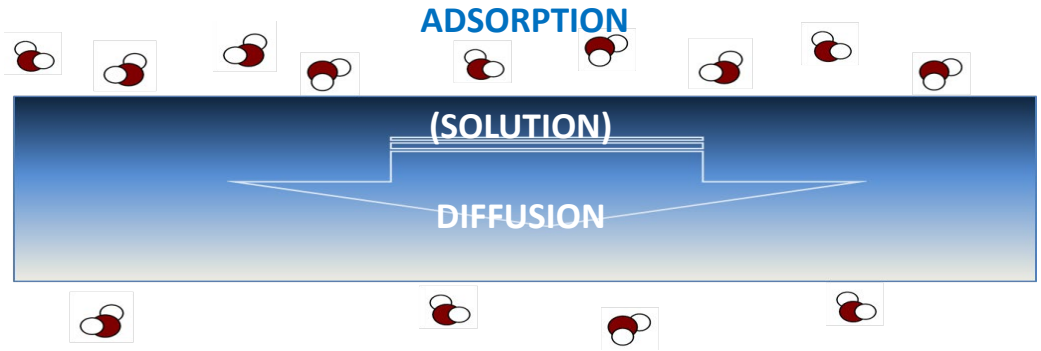
Permeation Through Passive Barriers

Homogeneous Solids



- WVTR = f(T, RH)
- P = D · S
- FICK'S LAWS HOLD

Full **transparency**, **getter** functionality **at molecular level** (no particles) and **very high quality** of the deposited **film** make the AqvaDry family a versatile class of active fillers for flexible encapsulation and TFE

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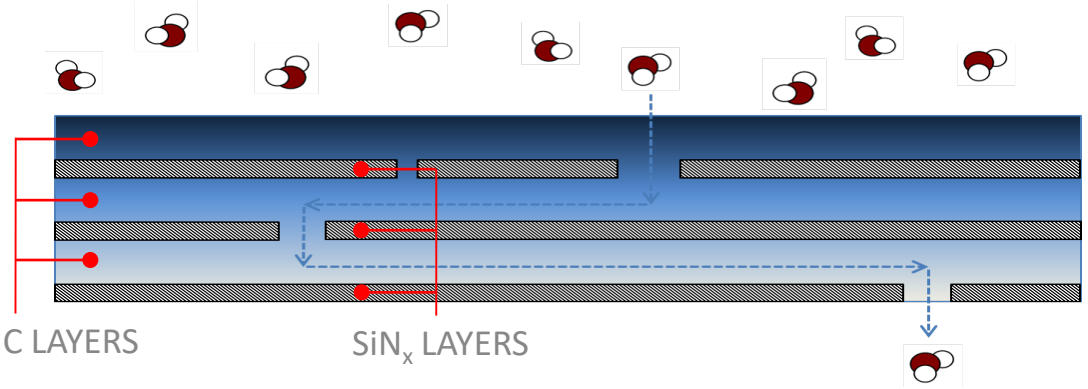
Permeation Through Passive Barriers in TFE

TFE Multilayers

FICK'S LAWS
+
DEFECTS PERMEATION



Full **transparency**, **getter** functionality **at molecular level** (no particles) and **very high quality** of the deposited **film** make the AqvaDry family a versatile class of active fillers for flexible encapsulation and TFE

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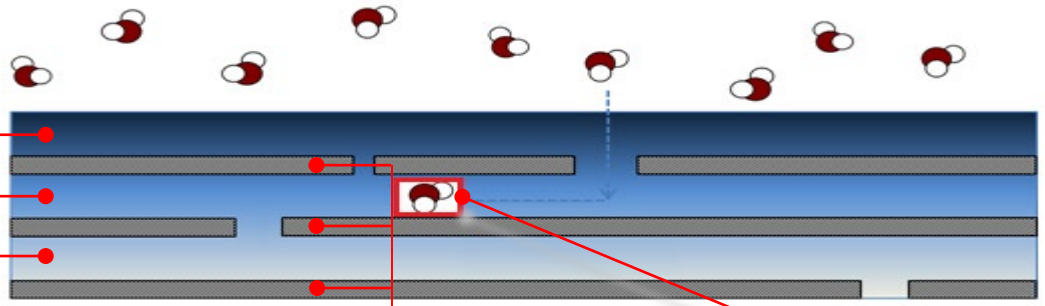
Permeation Through Active Barriers in TFE

TFE «Active» Multilayers

FICK'S LAWS
+
DEFECTS PERMEATION

GETTER



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AqvaDry®

Special transparent acrylics for moisture sorption and planarization layers

Version	AqvaDry®	AqvaDry® OCA	AqvaDry® Ink
Viscosity [cP]	550	1400	15 - 42
Moisture capacity [% wt]	> 4	> 5	0.7 – 1.7
Degree of Flexibility	Slightly Bendable	Flexible / Foldable	Flexible / Foldable
Dispensability	Syringe, blading, screen prt.	Syringe, blading, screen prt.	Ink-jet, spin coating
Appearance	Fully Transparent	Fully Transparent	Fully Transparent
Curing	UV, VIS	UV, VIS or Thermal	UV, VIS or Thermal

Full **transparency**, **getter** functionality **at molecular level** (no particles) and **very high quality** of the deposited **film** make the AqvaDry family a versatile class of active fillers for flexible encapsulation and TFE

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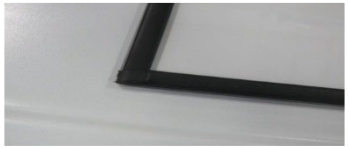
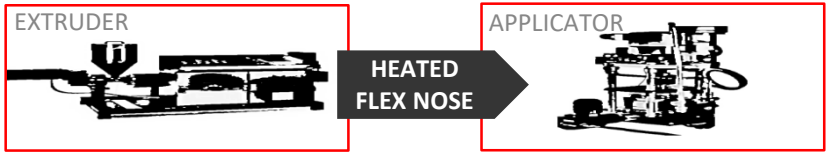
Dispensable Materials for Flex Encapsulation

Specifically designed for Flexible and Plastic Electronics applications

H-Dry™

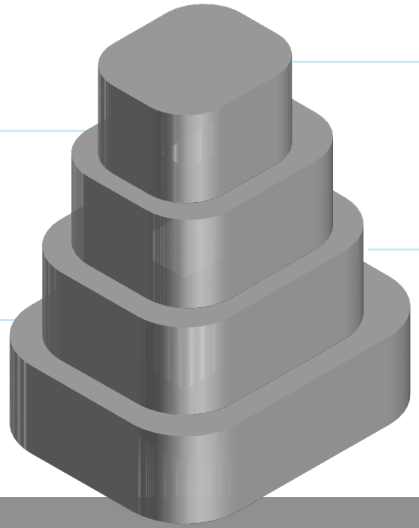
A versatile polyolefin based active barrier sealant, for large panels





LARGE AREA
THICK BARRIER

PELLETS or TAPE



FLEXIBILITY

MOISTURE GETTER
CAPACITY

A **hot melt** dispensable edge sealant, consisting of a **polyolefin organic matrix** with a powerful **chemical getter** dispersed.
An edge sealant incorporating a getter provides a **superior barrier against moisture** and it can be defined as an ''active barrier''

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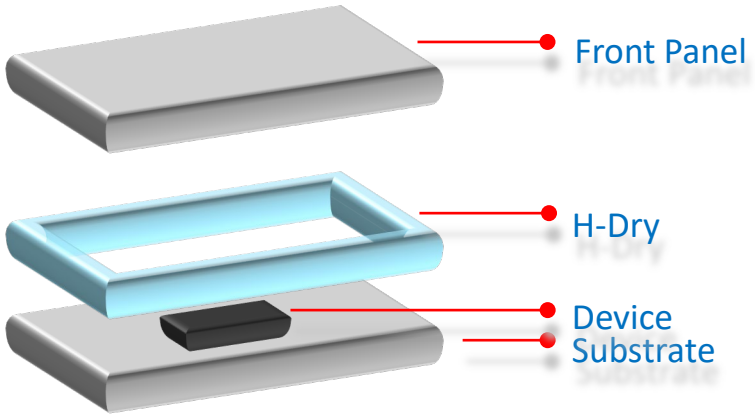
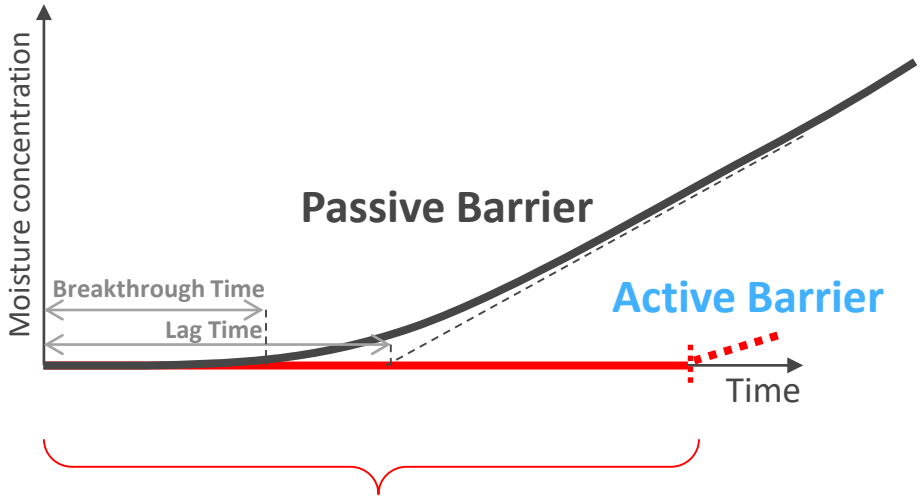
H-Dry™

A versatile polyolefin based active barrier sealant, for large panels

Flexible Active Edge Seal



Breakthrough time : 2500 hours
for a 10 mm wide H-Dry barrier at 85° C, 85% RH



A **hot melt** dispensable edge sealant, consisting of a **polyolefin organic matrix** with a powerful **chemical getter** dispersed.
An edge sealant incorporating a getter provides a **superior barrier against moisture** and it can be defined as an ''active barrier''

©SAES

H-Dry™

A versatile polyolefin based active barrier sealant, for large panels

H-Dry™

Version	H-Dry™	H-Dry™ TR	H-Dry™ Tape
WVTR [g/m²·day] 1mm	0.3 (25°C 55% RH)	0.3 (25°C 55% RH)	0.3 (25°C 55% RH)
Moisture capacity [% wt]	> 6	0.0	0.0 - 6
Degree of Flexibility	Bendable	Bendable	Bendable
Dispensability	Extruder + Applicator	Extruder + Applicator	*ND*
Appearance	Black	Translucent	Black or Translucent
Curing Step Temperature	140-150 °C	140-150 °C	140-150 °C

A **hot melt** dispensable edge sealant, consisting of a **polyolefin organic matrix** with a powerful **chemical getter** dispersed.
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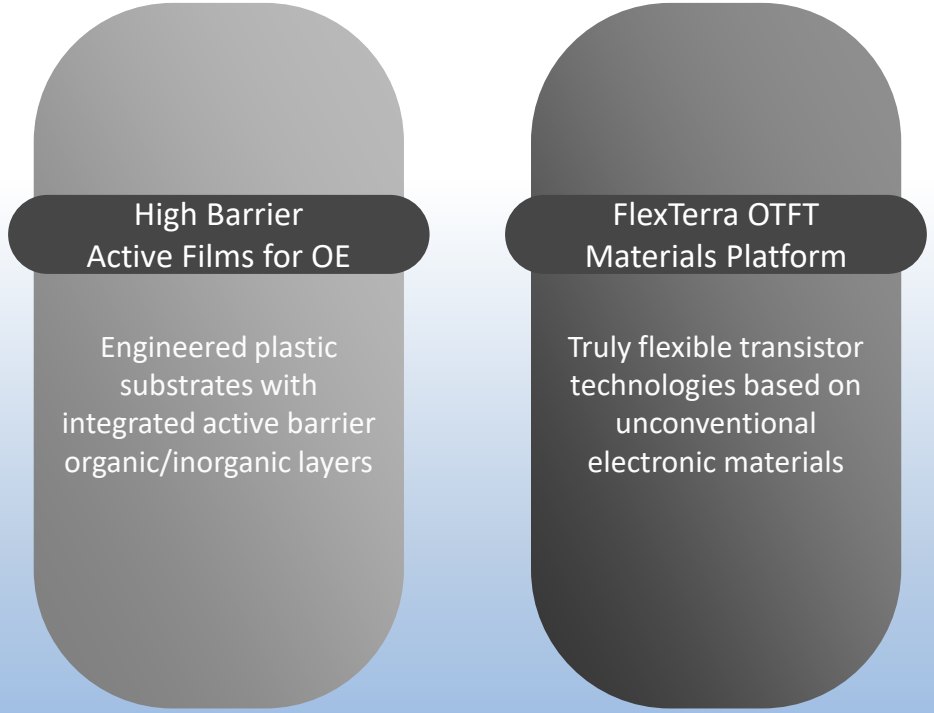
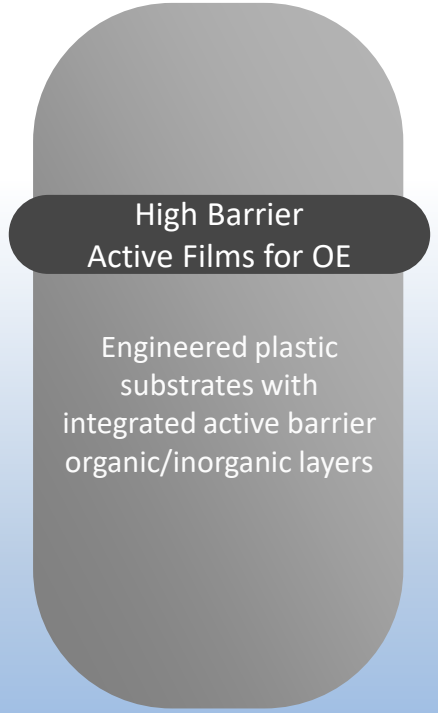
Active Barrier Films and OTFT's

Enabling Flexible Electronics Products



Active Barrier Films and OTFT's

Enabling Flexible Electronics Products



High Barrier Active Films for OE

Engineered plastic substrates with integrated active barrier organic/inorganic layers

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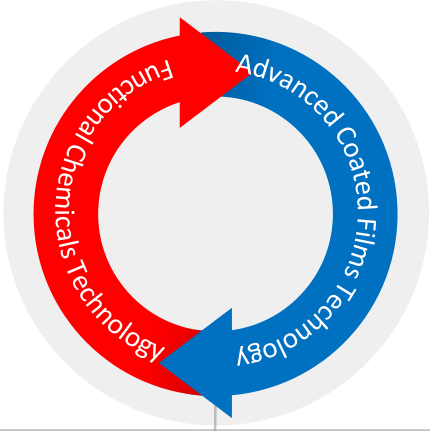


saes coated films
Advanced coatings
for sustainable solutions

SUNFLOWER EU Project

Best Publicly Funded Demonstrator award in the 2016 OE-A competition

AGFA · amcor · FLUXiM · Fraunhofer ISC · BASF · BELECTRIC · Genes'Ink · ISMN · CHALMERS · cnrs · Linköping University · saes getters · csem · DuPont Teijin Films · Universiteit Antwerpen · Universitat Jaume I

SAES Coated Films

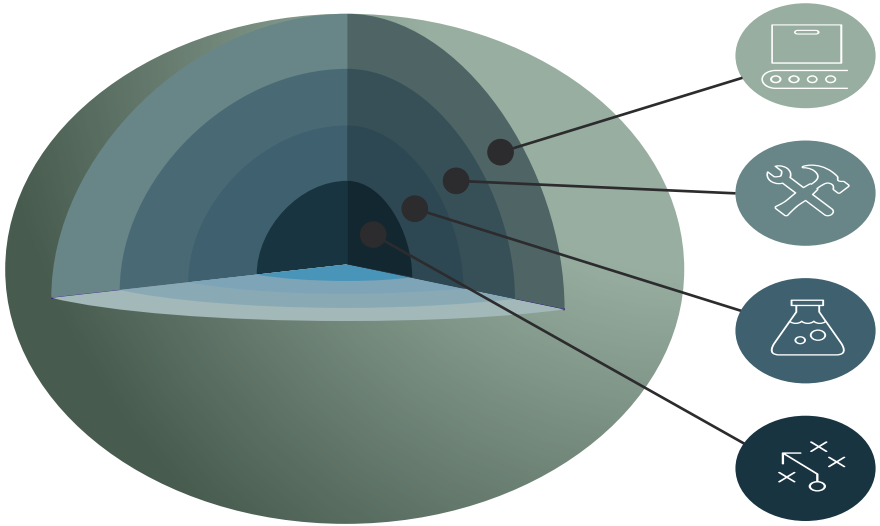
Active, Eco-Friendly, Compostable Coated flexible films for converters

2019: High Barriers for OE

Flexible Active Barrier substrates for Organic Electronics, IoT

High Barrier Active Films for OE

Engineered plastic substrates with integrated active barrier organic/inorganic layers



Advanced Packaging Know-how

Film Coating Technology

Polymer Functionalization Design

Barriers and Getters Core Competence

Flexible electronics substrates based on plastics (PET, PEN, PI) with very demanding properties: mechanical **flexibility**, **very low WVTR** and **OTR**, **transparency**, **robustness**, **high temperature** and **low temperature** resistance

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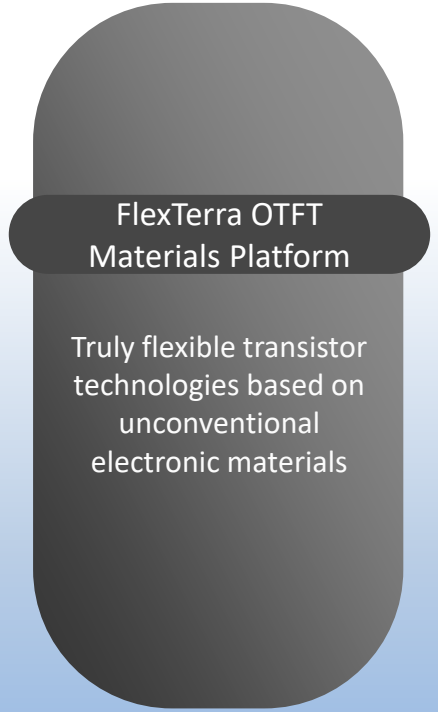
Active Barrier Films and OTFT's

Enabling Flexible Electronics Products



FlexTerra OTFT Materials Platform

Truly flexible transistor technologies based on unconventional electronic materials

Flexterra

a SAES Partner

Semiconductors Organic n-type

- $\mu > 5.0\ cm^2/Vs$
- Vapor, solution processable and printable options

Semiconductors Organic p-type

- $\mu > 2.0\ cm^2/Vs$
- Vapor, solution processable and printable options

Dielectrics

- Compatible with both n- & p- type OSCs
- Photopatternable, solution processable and printable

Interfacials & Passives

- Substrate, electrode modifiers
- Adhesion promoters
- Passivation materials

Flexterra **Flexible Thin-Film Transistors** (TFTs) are at the core of **FlexTerra Digital Fabric Technology**. They can be easily used in standard display fabs, as well as with other advanced manufacturing techniques.

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FlexTerra OTFT Materials Platform

Truly flexible transistor technologies based on unconventional electronic materials

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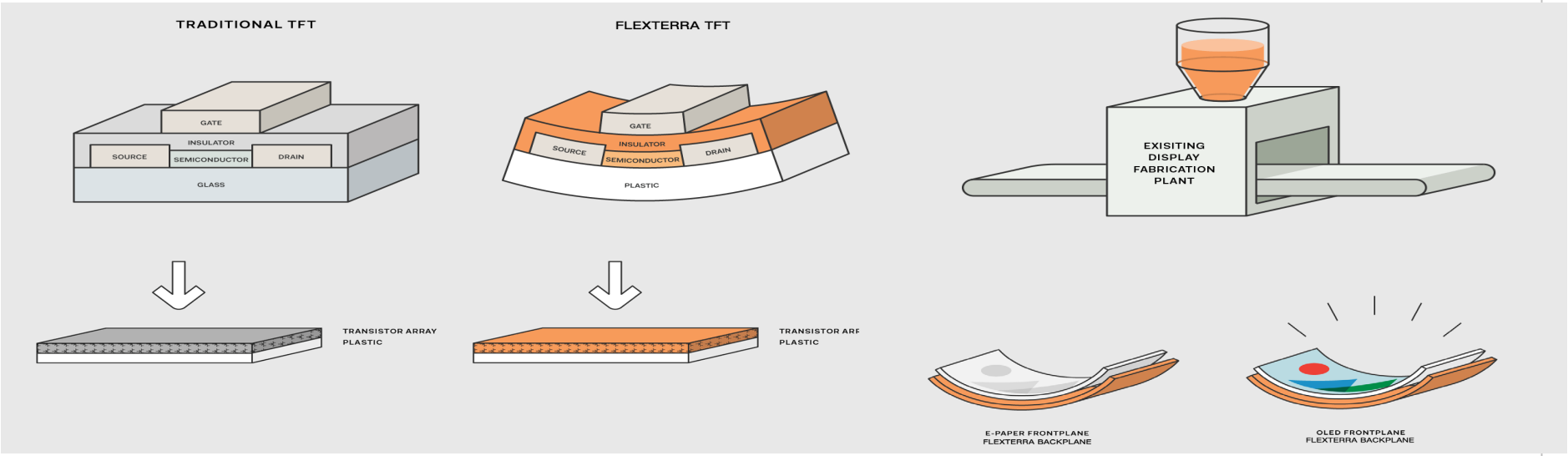

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