meetingPACK 2017

3rd EDITION

Estrategias para el aumento de la vida útil en el envasado de alimentos

Packaging strategies for food shelf life extension

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ainia AIMPLAS

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Session 5 "Latest trends in packaging solutions"

Strategies for increasing the food packaging shelf life.

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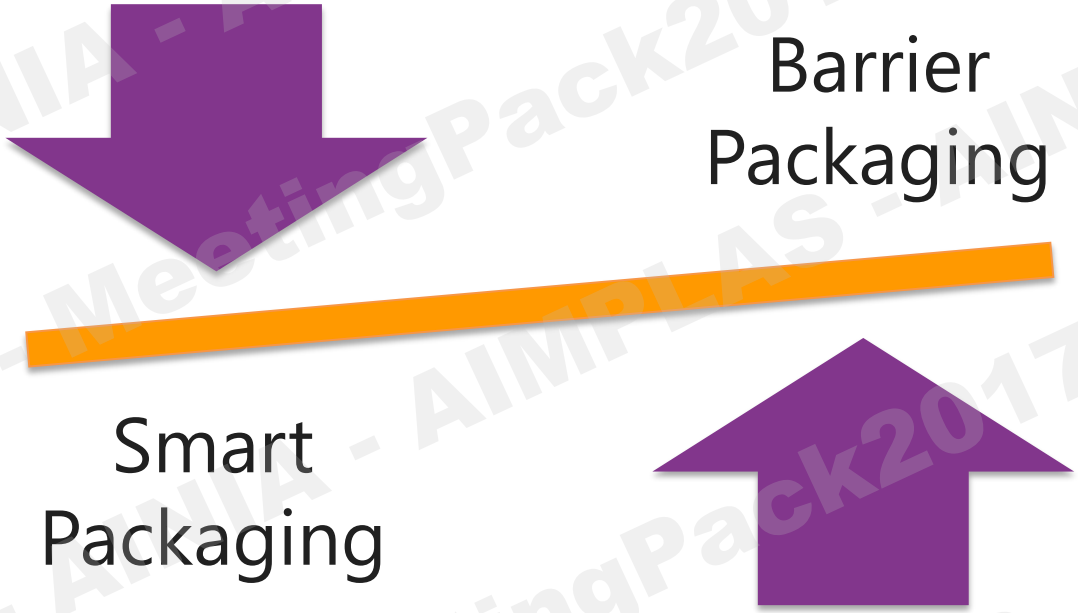
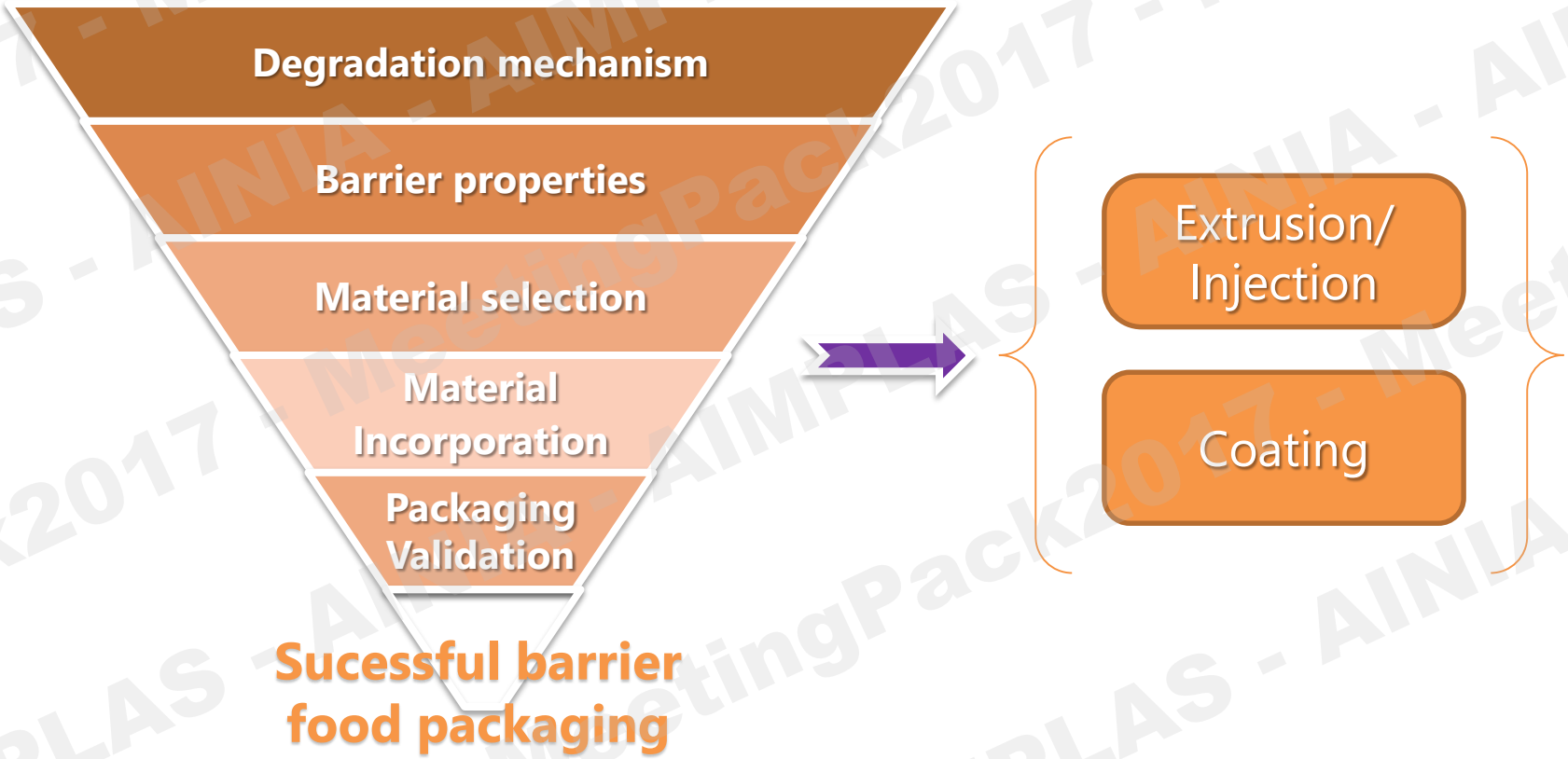
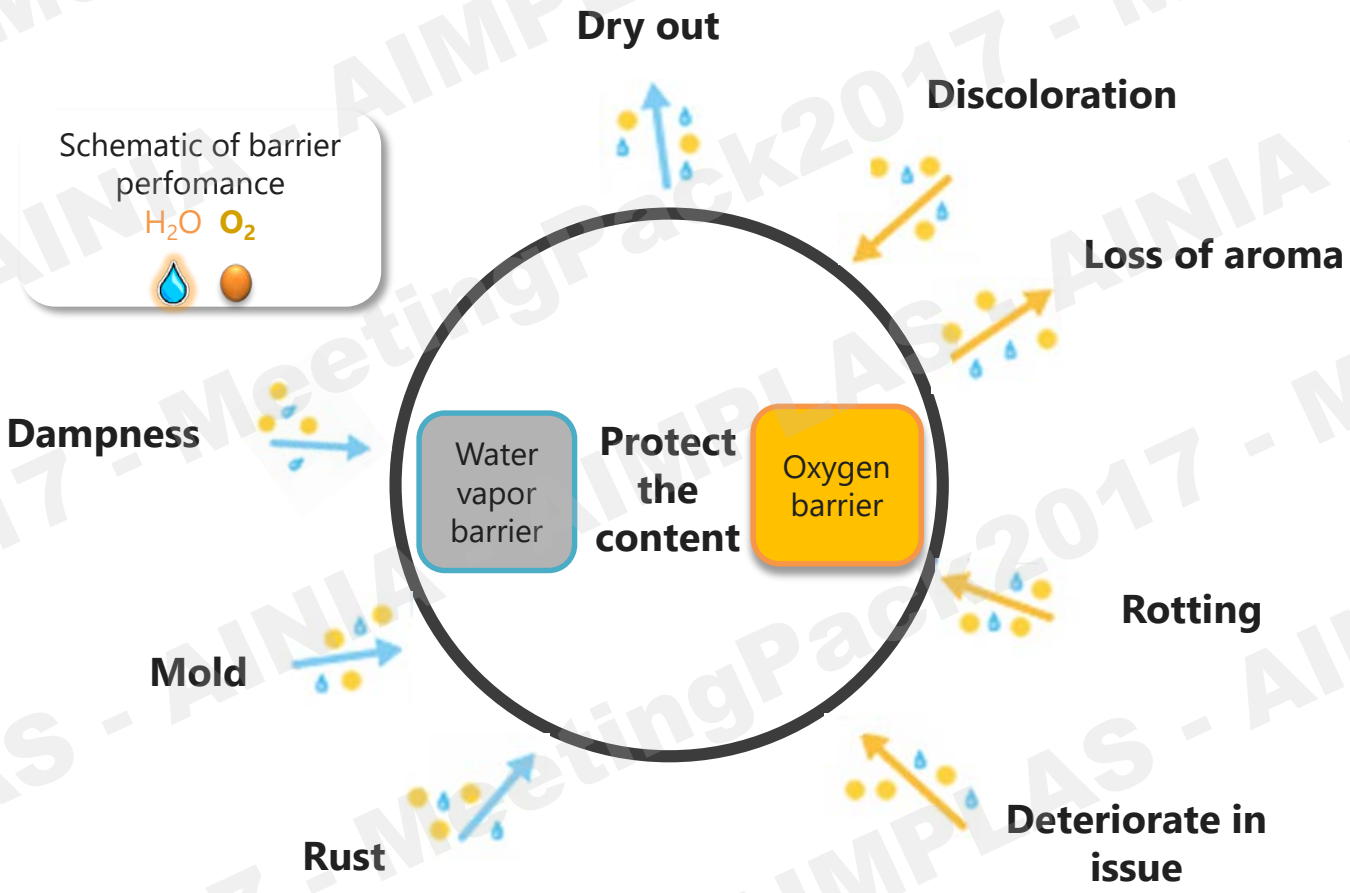


Barrier packaging

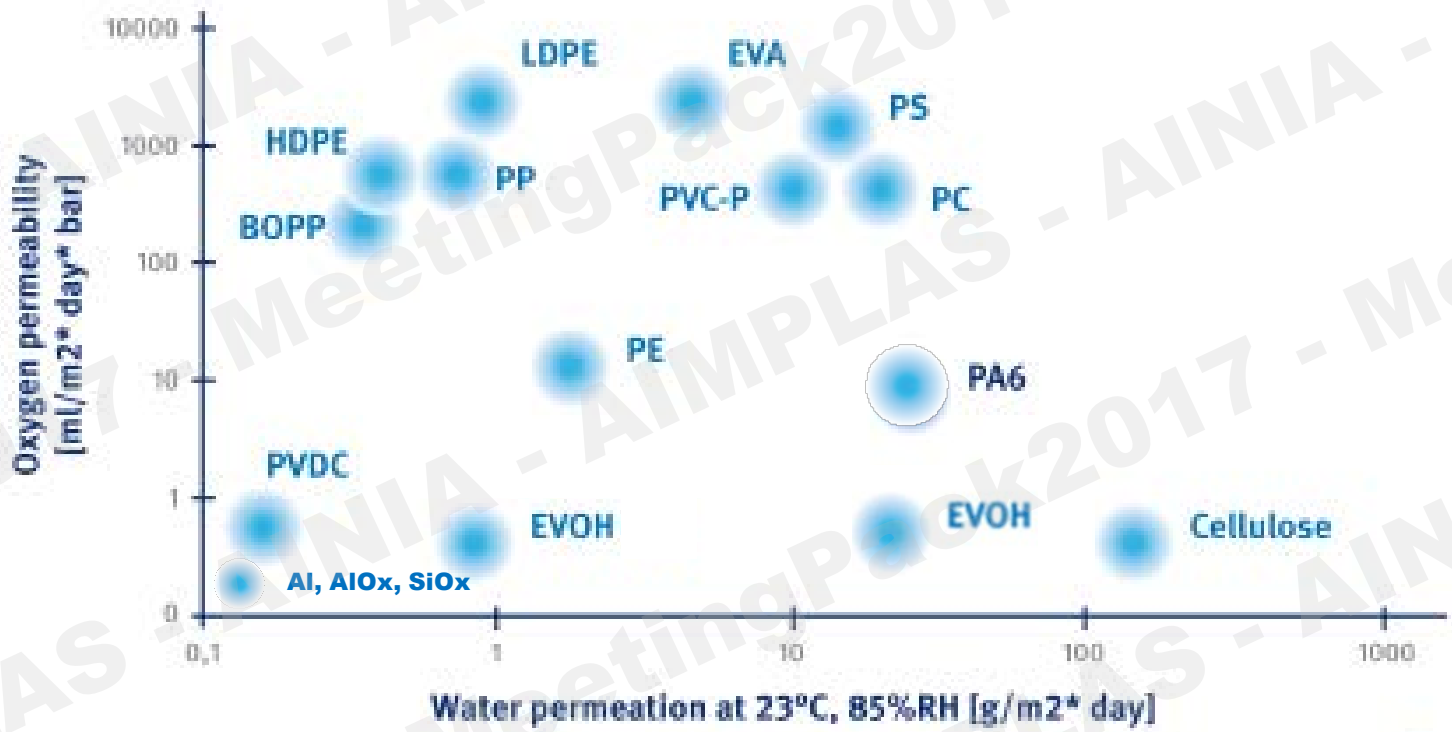
Barrier properties methodology



Degradation mechanism: influence of O_2 & H_2O



Material selection



Material selection & Material incorporation: extrusion/injection

Multilayer barrier packaging

Conventional approaches

Barrier material EVOH

New approaches

Oxygen barrier material: Tailored made PVOH for multilayer applications.

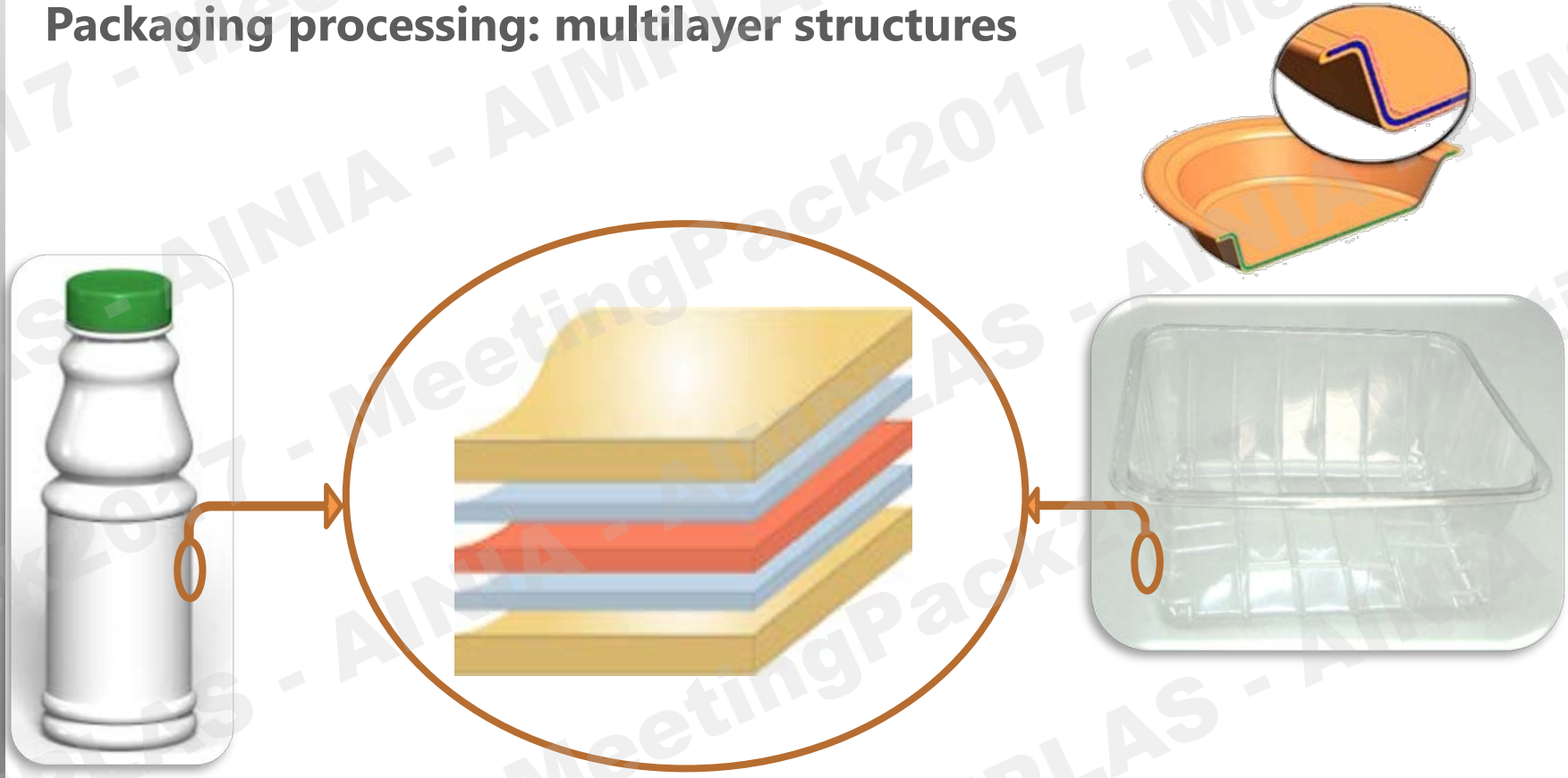
Material selection & Material incorporation: Bulk

Multilayer process: Extrusion/Injection

- **Barrier material characteristics:** Viscosity, Melt Temperature.
- **Process parameters:** Temperature, Speed, Residence time.

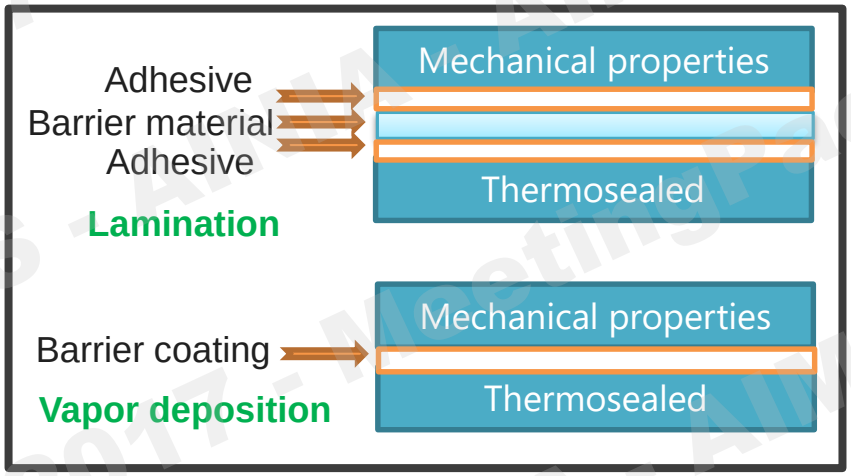
Material selection & Material incorporation: mass

Packaging processing: multilayer structures

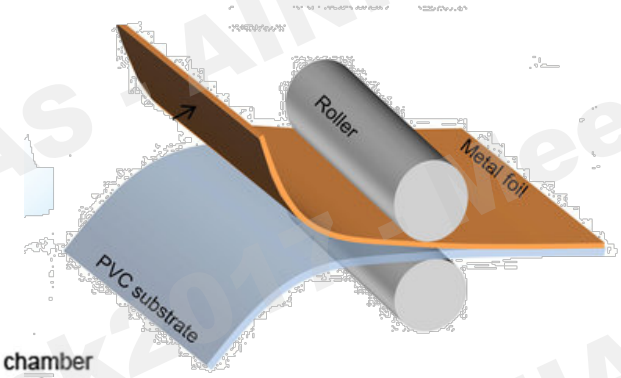


Material selection & Material incorporation: coating

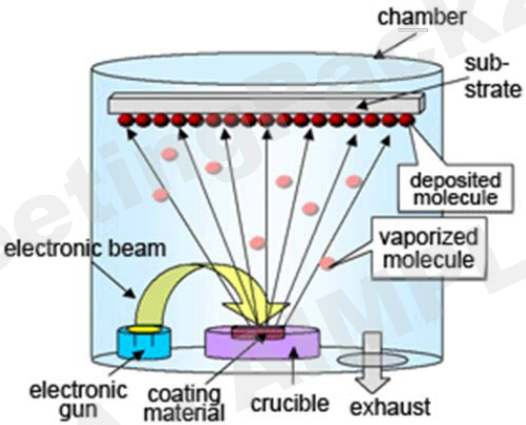
Conventional approaches



Adhesive: cohesion function between material

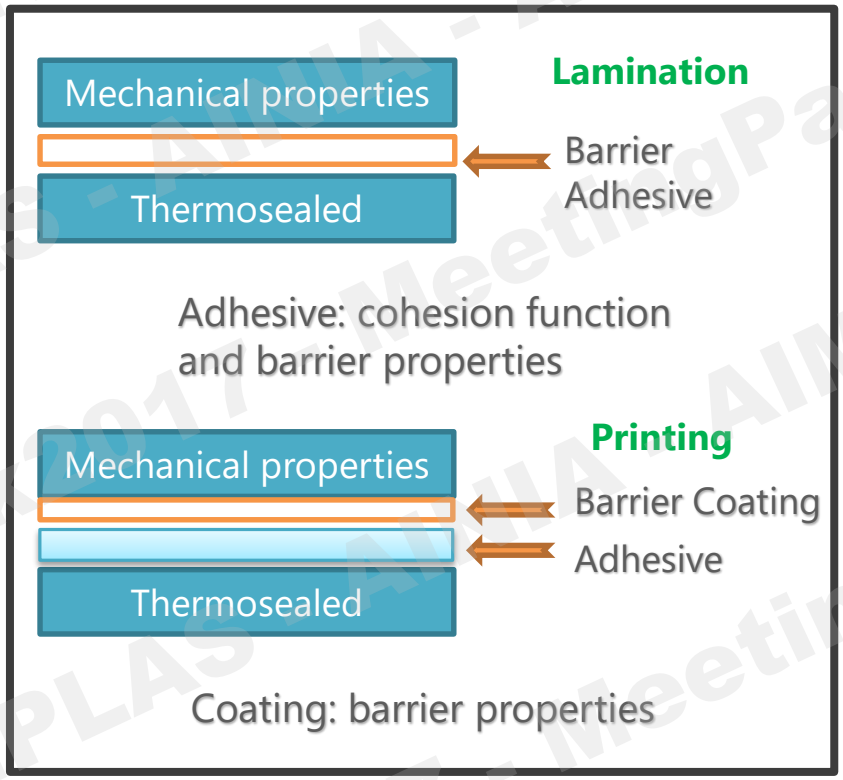


CVD /PVD coating: vacum system

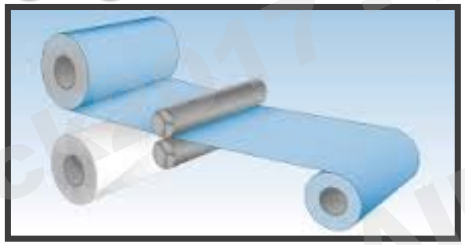


Material selection & Material incorporation: coating

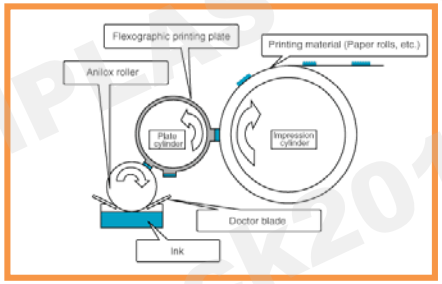
New approaches for flexible packaging



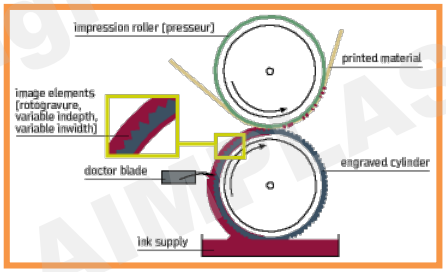
Lamination



Flexography



Gravure



Material selection & Material incorporation: coating

Dispersion condition:

- **Barrier** additive characteristics
- **Composition**: % polymer, solvents and additives.
- **Process parameters**: temperature, time, speed.
- **Disk dimension**.

To obtain flexible printing or lamination coating
Viscosity 50-200 cps

Conclusions-Barrier packaging strategy.

Barrier packaging: extrusion/injection

- Solution for printed & non printed packaging.
- Multilayer structure:
  - thickness reduction.
  - Cost reduction.
  - Improved properties.
- No residues generated.
- Possible to be combined with lamination.

Barrier packaging: coating

- Solution for printed packaging.
- Simplify the packaging manufacturing process.
- Reduction of time/steps in packaging production.
- Increase printing/lamination machine possibilities.
- New market for coating producer and food industry.

- Barrier properties customized by product and customer.
- More sustainable packaging structures.
- Modified Atmosphere Packaging- specific respiration needs for each packaged food product.
- Reduction in food waste.

Smart packaging

Smart packaging: special features

Smart packaging interacts with food or packaging atmosphere to extend shelf life, monitor freshness, display information on quality, improve safety, and improve convenience.

Foodstuff and their characteristics

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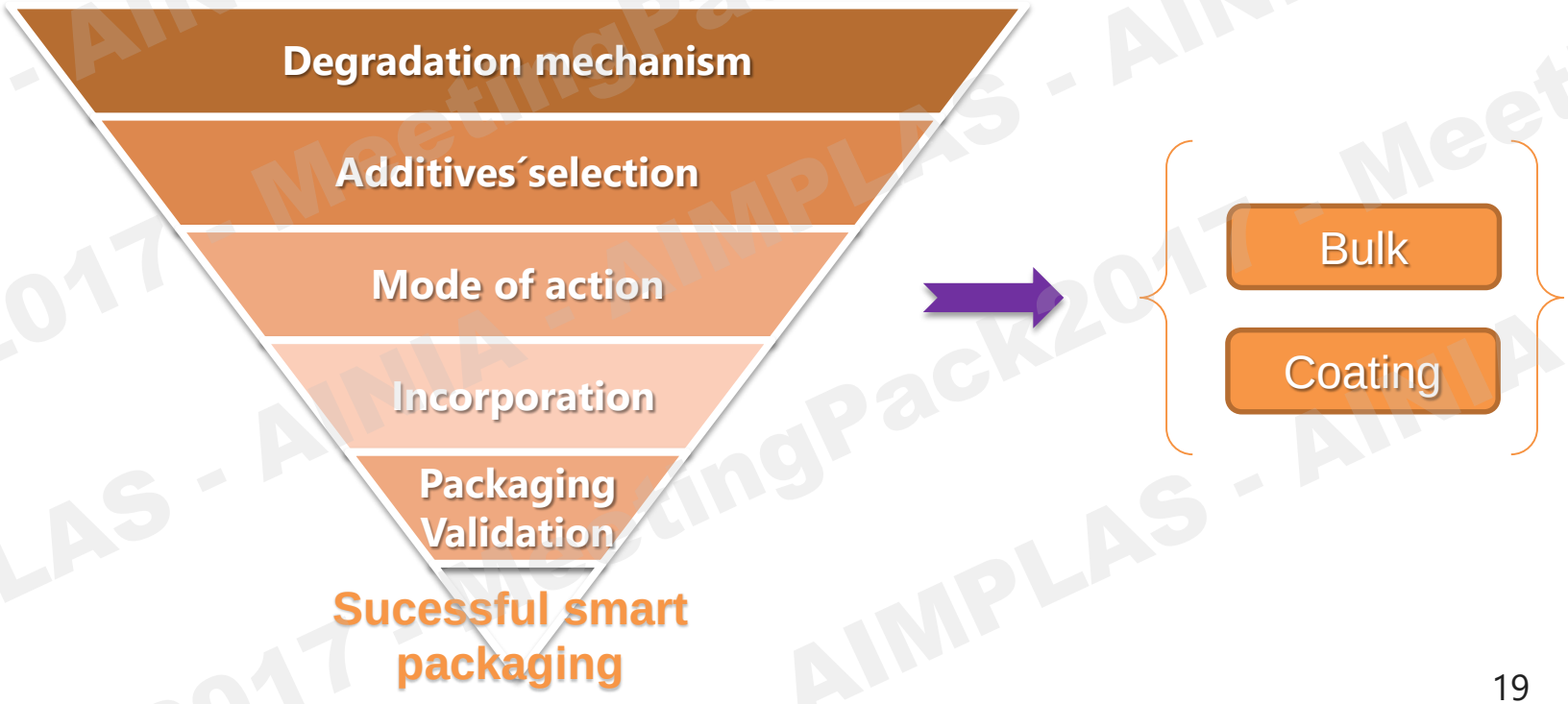
Format, packaging conditions and shelf life

Desired effect

1. Oxygen control
2. Limit the microorganisms growth
3. Delay enzimatic reactions

Smart packaging: methodology

Due to the wide range of foodstuff, packaging requirements and degradation factors, the material selection and the design and development of active packaging is essential. For that purpose, **AIMPLAS** works following a **successful methodology**:



Degradation mechanism

Degradation in foodstuffs is produced by different **external** and **internal** agents. The process continues until the foodstuff becomes unacceptable for human consumption.

Ripening

Mould growth

Additive´s selection & Mode of action

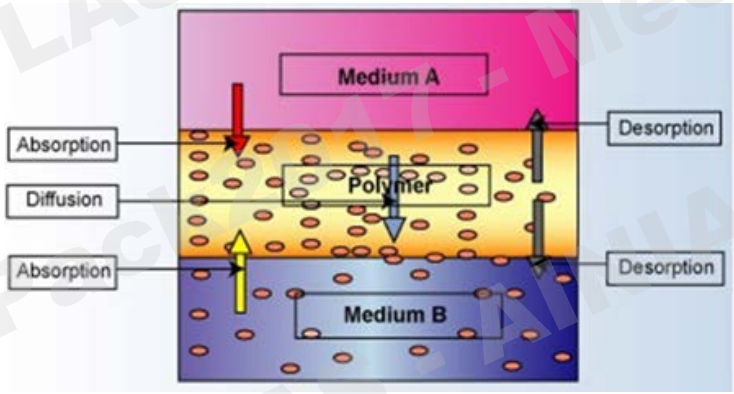
- Agent to be controlled → additive's effect: scavenger, antimicrobial, antifungal, antioxidant.
- Additive's origin (natural or synthetic)

Natural extract, essential oils, synthetic compound.

- Additive's mode of action: contact and/or release, depending on the packaging requirement.

Direct contact effect

Release effect



Limitations

Organoleptic issues, handling issues, regulation issues

Incorporation to the packaging

The **methodology** choice depends on:

- Packaging type
- Additive's physical characteristics
- Additive's mode of action

Incorporation to the packaging is another key-point in active packaging. Different technologies are available in AIMPLAS for this aim:

- Coating
- Bulk-additivation process by masterbatch in extrusion and injection

Coating: dipping or spraying

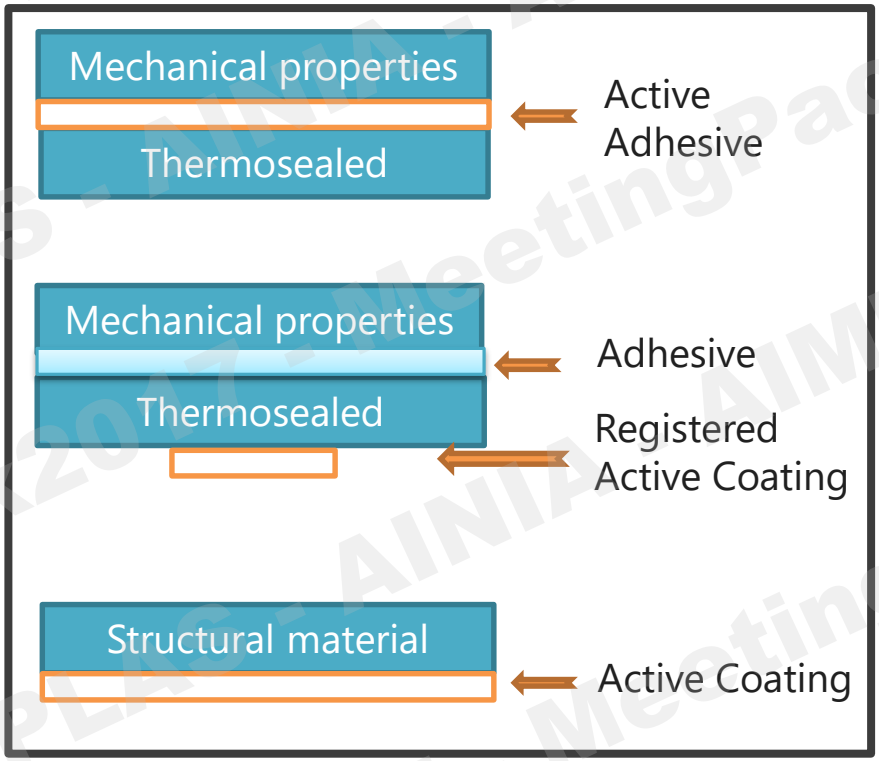
In mass, masterbatch

Bulk aditivation

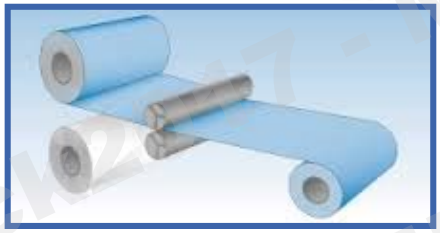
Co-rotating twin screw extruder to optimize additives dispersion and distribution.

- **Active additive** characteristics
- **Screw configuration** (dispersion/distribution) and barrel design.
- **Process parameters**: temp, speed, residence time and SME.
- **Composition**: % polymer and additives.

Coating aditivation



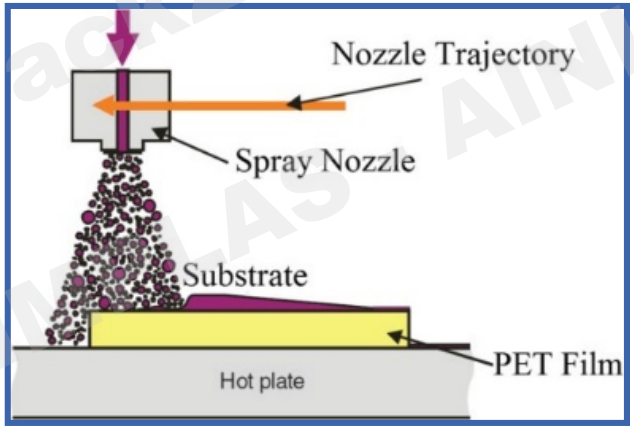
Lamination



Flexography

Gravure

Spray coating

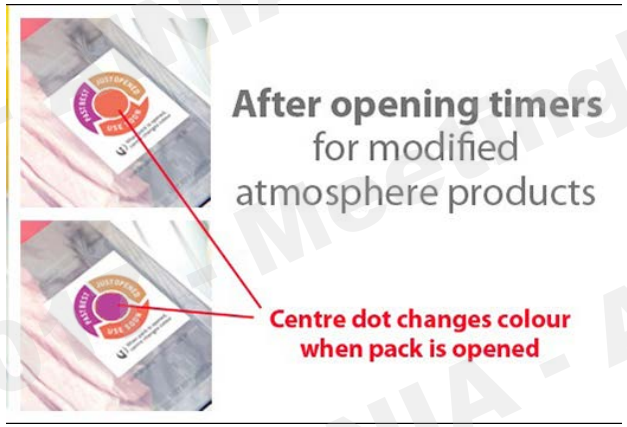


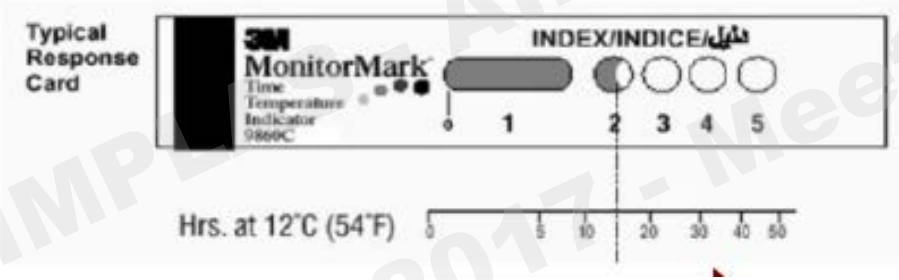
Intelligent packaging

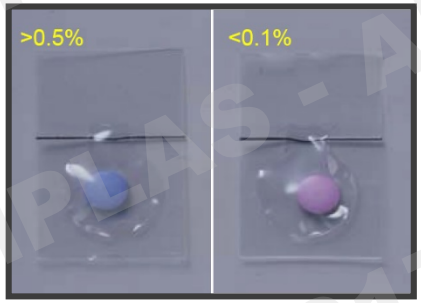
Intelligent packaging strategies for food waste reduction

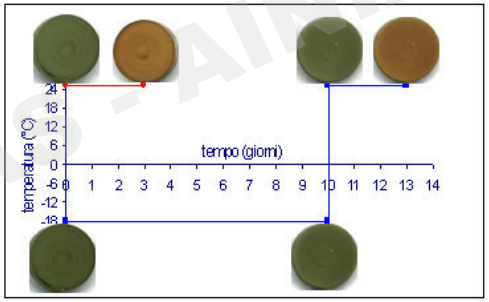
Chemicals based
- **Leakage indicators**
- **Freshness indicators**

Physicals based
- **Time+Temp. indicators**
- **Shock/Damage indicators**









Conclusions-Smart packaging strategy

Smart packaging

- Foodstuff degration depend on the product .
- Packaging type/additive characteristic and mode of action will decide the way of incorporating the actives in the Packaging.
- Bulk/mass incorporation works with MB solution for extrusion and injection process.
- Coating are applied by conventional printing technologies and lamination process.
- Intelligent solution can control product shelf life and is a differente strategy to be considered to reduce product waste.
- Limitation to consider: organoleptic , handling and regulation issued.

Final Conclusions-Packaging strategies for Food shelf Life Extension

- There is not a unique strategy for food shelf life extension.
- Multilayer structures seem to be the best option.
- There are two different strategies for shelf life extension: barrier packaging and smart packaging.
- Barrier packaging strategy can improve oxygen, water barrier, that allows MAP incorporation.
- Smart packaging strategy can extend the food shelf life by interacting with the product.
- Both strategies offer solution to be processed in extrusión, injection, lamination or printing.
- Smart packaging monitor food product freshness or incorporate active to the food packaging.

Both strategies can work together to obtain the best solution for food shelf life extension. Cost studies need to be performed in each particular case for the final decision.

Thank you!

ainia centro tecnológico

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