High Performance Transparent AlOx film

Product description: VisClear™-AlOx

Overview

1. **Benefits of high barrier transparent films, AlO_x as packaging material**

2. **ENGICCS process:**

   - The process AlO_x
     - Using the Transverse OxyFlow Management System (TOFMS) – High performance
     - Using the Singular OxyFlow Management System (SOFMS) – Standard performance

3. **Product Specification: VisClear (high & standard performance AlOx films)**

Benefits of high barrier transparent films

1. Excellent barrier properties (gases, light, odor) → **Functional**
2. Process control → deposited film thickness (nm range),
3. amount of Al wire required → **Economical**
4. Visibility → quality control & communication (fresh packaging)
5. Retortability / Microwaveability → **Comfortable**
6. Printing & lamination process ability → **Sustainable**

Production processes of AlOx

a) **Transverse** OxyFlow Management System (TOFMS) – High performance

b) **Singular** OxyFlow Management System (SOFMS) – Standard performance

Evaluation of PET – AlO_x deposition processes

PET (12µm)	VisClear – AlOx - 020	VisClear – AlOx - 010
Uniformity of AlOx	≥ 20 %	± 10 – 15 %
Process control (input/output stability)	Marginally stable	Conditionally stable
Barrier properties (PET) **(stability of shelf life / weeks)**	OTR & WVTR **> 1.5** *OTR: cm³/m².d (23°C, R. H. 50%),* *WVTR: g/m².d (23°C, R. H. 50%)* ***~ 8 weeks***	OTR & WVTR **< 0.6** *OTR: cm³/m².d (23°C, R. H. 50%),* *WVTR: g/m².d (23°C, R. H. 50%)* ***~ 24 weeks***
Gelbo-flex test (ASTM-Standard F392)	50% loss of WVTR after 20 cycles	10% loss of WVTR after 20 cycles

Process steps for high performance AlO_x films

1. Unique Surface Modification (Pre-Treatment)
2. Gradient Oxidation Process (Pressure & Temperature input)
3. Surface Refinement (Post Deposition Treatment)

VisClear (TM) – AlOx films

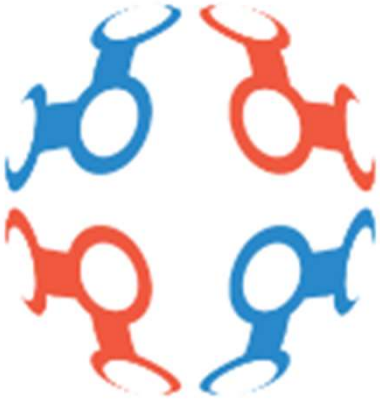
A crafted process for high performance films

Technical Performance

Vis-Clear 020

Vis-Clear 010

Standard (conventional)



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