

BOPP Based Barrier Films with Additional Functionalities

Introduction:

BOPP barrier films are very well known in the industry. Several years ago the majority of them were metallized BOPP films, nowadays more and more transparent BOPP barrier webs are available, either based on EVOH resins or transparent (vacuum) coatings, such as AlOx or SiOx. The latter can be applied in extremely thin layers (10-80 nm), this being advantageous regarding recycling concepts (mono material). Additionally, BOPP barrier films can be provided with high seal strength functionalities, in certain cases allowing packaging laminate simplification (3-ply to 2-ply)¹. This “latest news” article highlights some recent BOPP barrier developments in the Brückner Technology Center.

A) Metallized BOPP barrier films (HB, UHB and UHB-HSS)

We were recently able to combine an UHB BOPP barrier film with HSS (high seal strength) properties. The following data sheet presents the main characteristics of this sequentially produced UHB-HSS BOPP barrier web:

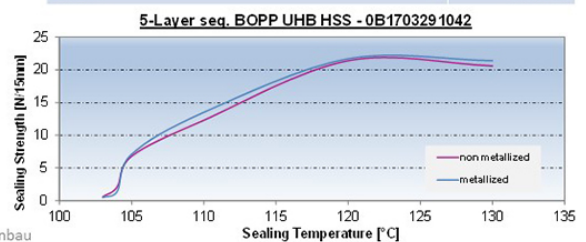
BOPP HSS – UHB - Film



Material	Gauge
Metallized surface	
High surface energy polymer	0.6 µm
PP	1.2 µm
PP core layer mod.	12.2 µm
PP copolymer blend	6.0 µm
Low SIT sealant mixture	2.0 µm
Total	22 µm

Highlights:

- Very high sealing strength 22 N/15mm
- Excellent barrier OTR & WVTR
- Al replacement
- Replacement of lamination steps
- Downgauging
- Good optics



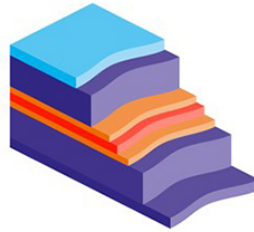
Properties of a metallized BOPP-ILC-film will be addressed in a separate “latest news” article on in-line coating (ILC), highlighting a cost effective BOPP HB (high barrier) solution (see the overview at the end of this article).

B) Transparent barrier films

EVOH based BOPP webs offer additional aroma and mineral oil barrier, the latter gaining more and more attention in the packaging industry as well as with the European Regulatory Authorities².

We have been able to produce on our pilot line a sequential HSS-variant for such transparent EVOH-based HB-BOPP barrier films, as shown in the following figure:

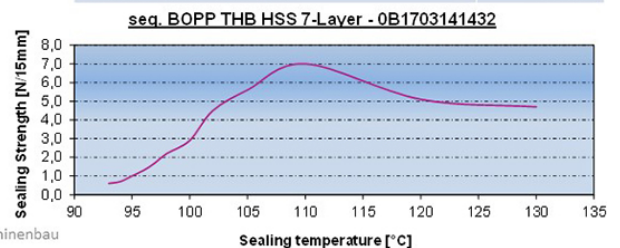
Transparent BOPP THB High Seal Films



Material	Gauge
PE-blend & additives	2.5 µm
PP + additives	7.7 µm
Tie-layer	1.5 µm
Barrier-layer EVOH (38% ethylene)	2 µm
Tie-layer	1.5 µm
PP + additives	7.7 µm
PP-Copo (corona treated)	1.0 µm

Highlights:

- Good oxygen barrier: 20 cm³/ m²bar
- High seal strength
- Good mineral oil barrier
- Good processability
- Excellent product presentation



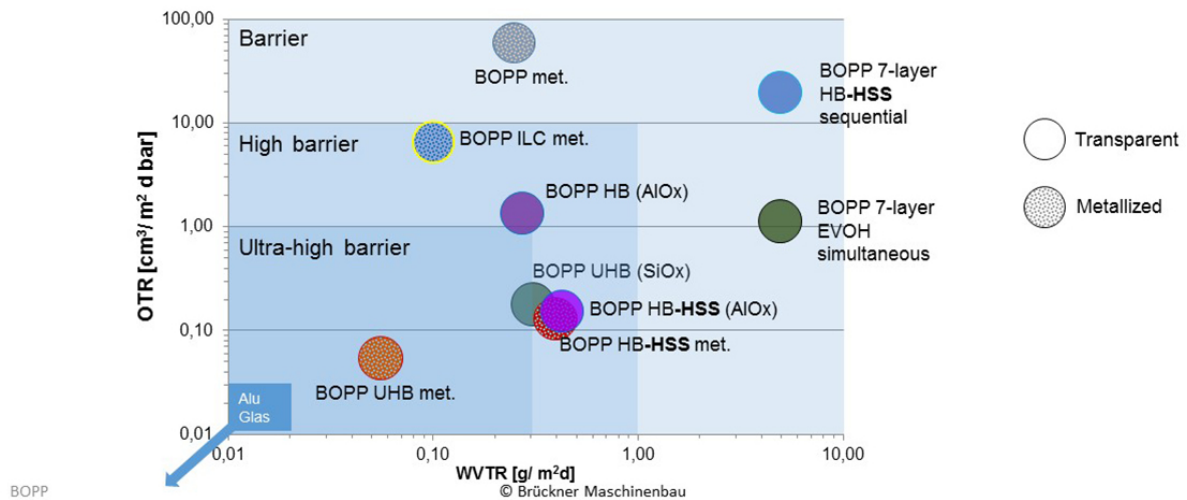
A transparent SiOx-based UHB-BOPP film, as well as a transparent HB BOPP film and a transparent HB-HSS BOPP film with AlOx-coatings are also available in our sample folders. These vacuum coated webs are EVOH-free. The first two variants have been produced with our LISIM® technology, the latter in the sequential mode (see the overview in the following figure).

C) Overview and outlook

The following figure gives an overview of different BOPP barrier films, transparent and metallized, with additional functionalities. There is a clear difference in OTR barrier values with EVOH based films, depending on the applied stretching mode. Also the BOPP ILC metallized BOPP HB barrier film is shown:

BOPP Barrier Packaging Films – Classification

OTR – WVTR barrier – properties, simultaneous & sequential



Future issues to be addressed will be:

- COF characteristics of metallized UHB-HSS-films (now: μs : 0.72 seal-seal)
- WVTR barrier improvement of metallized UHB-HSS-films (now: $0.42 \text{ g}/\text{m}^2 \text{ day}$)
- Further work on an AlOx-coated, transparent, sequential UHB-HSS-web for potential aluminium foil replacement
- Packaging trials (hermeticity) with experimental 2-ply laminates based on UHB-HSS BOPP films, metallized and transparent
- Measurement of mineral oil barrier for metallized UHB films

1) Latest News, 19th of December, 2016

2) Presentation Extendo (Dr. Rainers), Barriere-Verbundfolien, 13th-14th Sept., 2017