

***Polybatch* Electret Masterbatch for respiratory protective devices**

Masterbatch ADTS

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Respiratory Protective Devices

What is a FFP Mask?

- A Filtering Face Piece (FFP) mask is an individual respiratory protective mask designed to protect the wearer against the inhalation of both droplets and particles suspended in the air

Benefits:

- A FFP mask is more restrictive in terms of filtration requirements and comfort in use than a surgical mask (heat-related discomfort, breathing resistance), but it protects from inhaling infectious pathogens

Key requirements:

- FFP masks require filtration efficiency which is achieved via melt-blown and spun-bond layers
- The melt-blown fabric needs to be charged to have an efficient adsorption effect. For this static electricity to be stored, the material composition and structure needs to be conductive to charge retention



Face/Surgical mask



FFP1



FFP2



FFP3



LyondellBasell *Polybatch* Masterbatch for Melt Blown

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- The LyondellBasell *Polybatch Electret Masterbatch* can increase the density and depth of the charge, trapping energy in the melt-blown non-woven fabric, store charge to improve the comprehensive filtration of the melt-blown non-woven fabric
- LyondellBasell *Polybatch Electret Masterbatch* addition in final non-woven formulation can:
 - Increase the charging retention of Melt Blown Non-Woven improving the filtering quality and reducing the absorption of liquids



LyondellBasell *Polybatch* Masterbatch for Melt Blown

	PP based	MFI > 600 g/10' (230°C/2,16kg)	Melt blown technology	Properties
<i>Polybatch</i> SNW 722 TK4	✓	✓	✓	Good Charging properties Good Barrier properties
<i>Polybatch</i> SNW 922 TK13	✓	✓	✓	Good Hydrophobic properties
50/50 <i>Polybatch</i> SNW 722 TK4 + <i>Polybatch</i> SNW 922 TK13 [Referred to as TK15 in the test results]	✓	✓	✓	High aerosol barrier properties Good balance charging Hydrophobic and Barrier properties

Respiratory Protective Devices: Main EU Normative for Masks

■ EN 14683 for surgical mask (Bacterial Filtration Efficiency and Differential Pressure)

- There are different types of surgical masks:
 - Type I: bacteria filtering effectiveness > 95%
 - Type IR: bacteria filtering effectiveness > 95% and splash-resistant
 - Type II: bacteria filtering effectiveness > 98%
 - Type IIR: bacteria filtering effectiveness > 98% and splash-resistant

■ EN 149:2001+A1:2009 (Respiratory Protective Devices)

- All maintenance-free dust respirators that are placed on the European market must be approved according to the requirements of the European Personal Protective Equipment Directive REG. EC / 425 / 2016
- Mask effectiveness:
 - FFP1 masks which filter at least 80% of aerosols (inward leakage < 22%)
 - FFP2 masks which filter at least 94% of aerosols (inward leakage < 8%)
 - FFP3 masks which filter at least 99% of aerosols (inward leakage < 2%)

The above norms have been used to characterize *Polybatch* Electret Masterbatches

Tests and Sample comparison

- We have prepared 22 gsm meltblown samples at different masterbatch concentrations mixed in HOMO-PP MFI 1200
- **Samples have been characterized at external qualified lab (Eurofins*):**
 - Bacterial Filtration Efficiency (BFE). Method: EN 14683:2019+AC:2019
 - Differential Pressure. Method: EN 14683 Annex C
 - Method: NF EN 149+E1 (respiratory protective devices)*
- **List of the samples:**
 - PP REF w/o MB
 - PP REF + 2% Polybatch SNW 722 TK4
 - PP REF + 5% Polybatch SNW 722 TK4
 - PP REF + 2% Polybatch SNW 922 TK13
 - PP REF + 5% Polybatch SNW 922 TK13
 - PP REF + 5% TK15

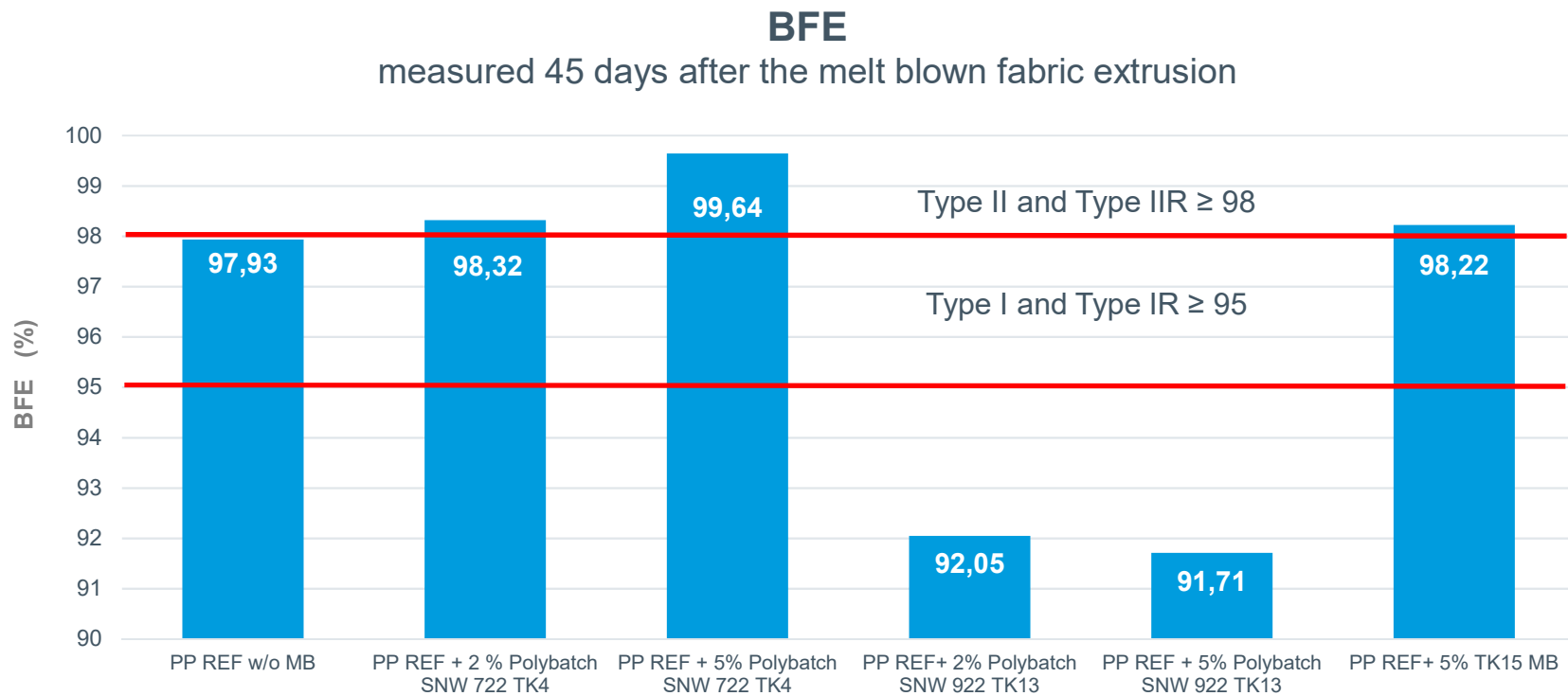


*Tests based on NF EN 149+E1 are still ongoing and are therefore not detailed on the next slides. Preliminary results showed that best performance are obtained by the combination of the TK4 and the TK13.

Bacterial Filtration Efficiency (BFE)

■ Normative EN 14683:2019+AC:2019 App B

- Type I and Type IR ≥ 95
- Type II and Type IIR ≥ 98



LyondellBasell Electret Masterbatches help to obtain higher and for longer time Bacterial Filtration Efficiency (BFE) protection

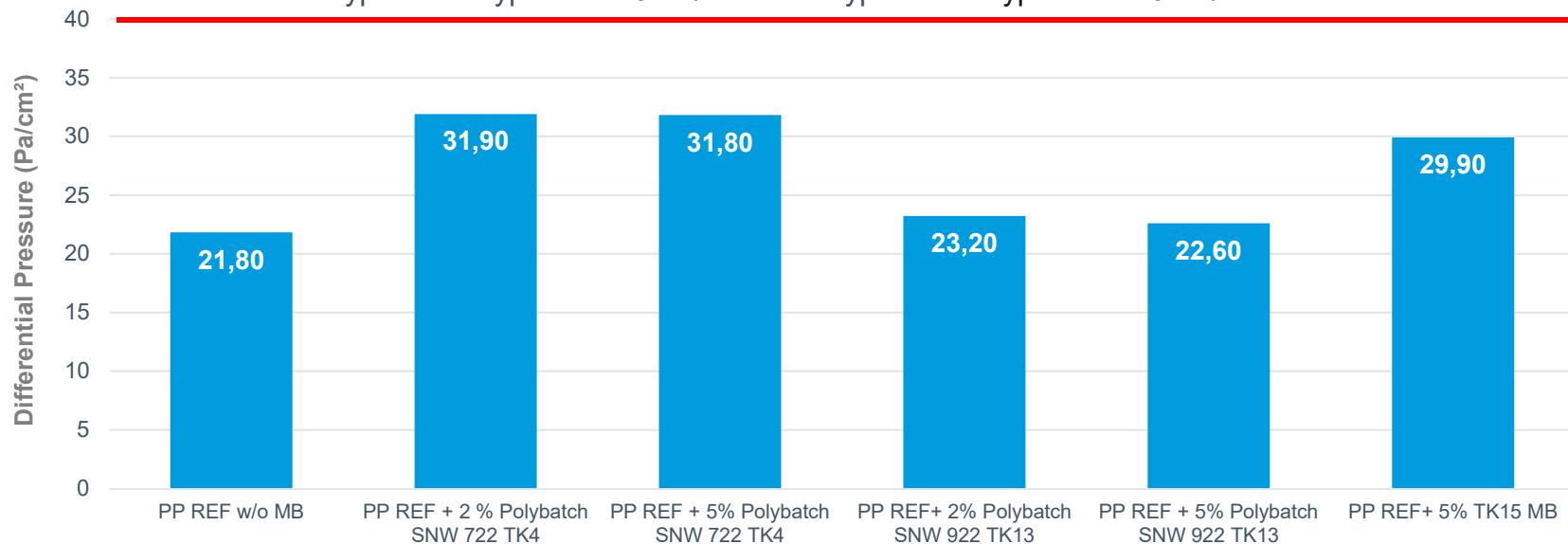
Breathability (Differential Pressure)

■ Normative EN 14683:2019+AC:2019 Annex C

- Type I and Type IR < 40 Pa/cm²
- Type II and Type IIR < 40 Pa/cm²

Differential pressure (Pa/cm²)
measured 45 days after the melt blown fabric extrusion

Type I and Type IR < 40 Pa/cm² and Type II and Type IIR < 40 Pa/cm²



**Filtering effect of LyondellBasell Electret Masterbatches
is confirmed by differential pressure results**

Conclusion

- ***Polybatch SNW 722 TK4 NAT*** can be selected for the preparation of those melt blown NW fabric that needs to maintain the **elected charging**
- ***Polybatch SNW 922 TK13 NAT*** can be selected for the preparation of those melt blown NW fabric that needs **hydrophobic properties**
- **50/50 mix of the *Polybatch SNW 722 TK4 NAT* + *Polybatch SNW 922 TK13 NAT*** (TK15 in the graphs/results) can be selected for the preparation of those melt blown NW fabric that needs to **combine good BFE, good differential pressure and good penetration of filter material**
- The Masterbatch can be easily mixed in PP-HOMO from MFI* 800g/10' up 1500g/10' (and more)
- Masterbatch concentration proposed to use is from 5% up to 10%

*MFI measured @ 230°C/2,16kg

LyondellBasell product offering

LyondellBasell is offering a large product range that is being used in a wide range of non-woven applications:

- PP & PB-1 grades for non-woven
- White & Black masterbatches specially designed for non-woven
- Functional additive masterbatches:
Anti-static, Anti-UV, Flame retardant,
Processing aids, Slip, Softness, ...
- Color masterbatches for nonwoven



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