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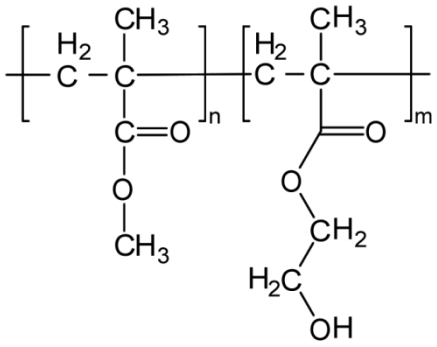
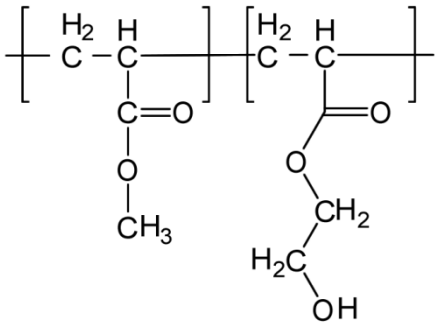
PolymBlend® Applicaton Notes

PolymBlend® is a polymer blend comoposed of two high molecular weight statistic copolymers (methyl methacrylate-co-hydroxyethyl methacrylate (M_w> 200 kDa) and methyl acrylate-co-hydroxyethyl acrylate (M_w> 2,000 kDa)) to produce non-woven nanofibre membranes with excellent mechanical and physicochemical properties which are difficult to achieve with conventional polymers. These copolymers can be mixed together in all proportions, allowing the tuning of the mechanical and physicochemical properties of the final products by only changing the ratio between them.



Copolymer A
Methyl methacrylate-co-hydroxyethyl methacrylate
(average M_w 200 kDa, PDI < 2.5)



Copolymer B
Methyl acrylate-co-hydroxyethyl acrylate
(average M_w 2,000 kDa, PDI < 1.5)

PolymBlend® has been thoroughly optimized for production by the electrospinning of nonwoven membranes with different percentages of OH groups in their structure. The **hydroxyl groups** of PolymBlend® **are primary**, and **thus they are highly reactive**. Therefore, PolymBlend® is very useful for designing and producing materials which can be easily functionalized.

PolymBlend® can also be used for the **formulation and preparation of polymeric films** using different techniques (spin coating, knife coating, curtain coating, etc.) as well as for the preparation of **thin coatings, porous membranes**, etc.

Characteristics of PolymBlend®

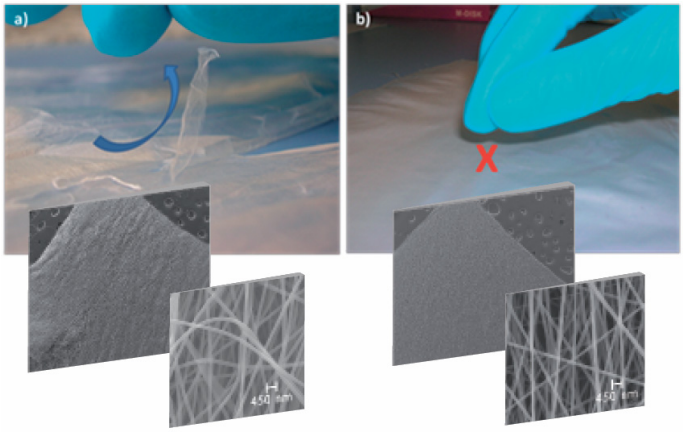
- It is miscible with other polymers and copolymers.
- It is soluble, up to 14% w/w, in DMF, DMSO, dioxane, NMP and solvents with similar polarities.
- It is resistant to acids and bases in a wide pH range (4.0 to 11.5)
- The percentage of the hydroxylated monomers in the polymer blend depends on the ratio in which the two copolymers are mixed. The following equation shows a simple way to calculate this percentage:

$$\%\ \mathrm{OH-monomers} = \frac{2.6 \cdot \mathrm{A} + 2.1 \cdot \mathrm{B}}{5.2 \cdot \mathrm{A} + 6 \cdot \mathrm{B}}$$

where A is the mass of copolymer A and B is the mass of copolymer B; both in the same units.

Characteristics of nonwoven membranes obtained with PolymBlend®

Mechanical properties: **high resistance to abrasion** (our blends have been optimised to obtain fibers which are perfectly welded to each other at the contact points without any fusion between them), **high tensile strength, high bursting resistance** (they can be used as filters for low and high pressure without breaking), **adequate flexibility and elasticity**, and **easy handling** (they do not release any residue).



a) Nonwoven membrane produced with a commercial methacrylate polymer

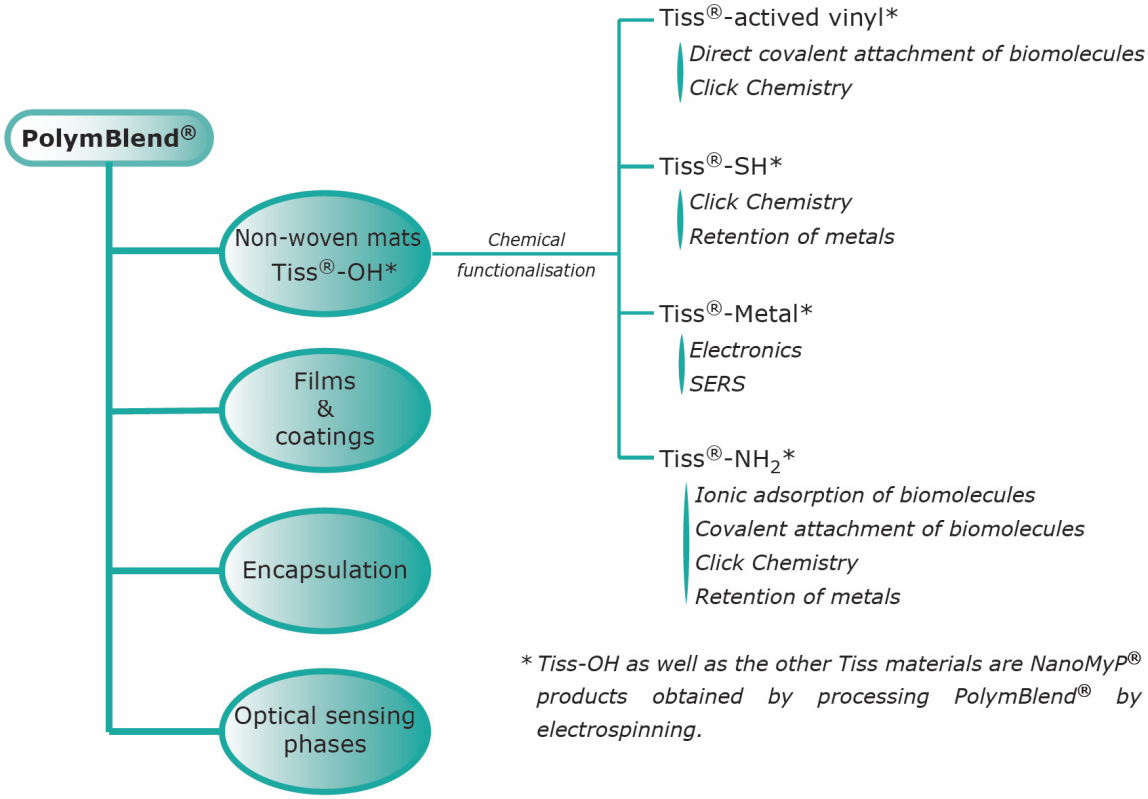
b) Nonwoven membrane produced with PolymBlend®

Chemical properties: they are **resistant to acids and bases** (pH between 4 and 11.5), **to hydrophobic organic solvents** (such as toluene, hexane, heptane, vegetable and mineral oils, etc.), **to hydroalcoholic mixtures** containing up to 30% alcohol and they are also temperature resistant.

Polarity: the materials obtained by using PolymBlend® are hydrophobic, but they can be easily transformed into highly hydrophilic ones (Q=2; Q is defined as the mass of absorbed water per mass of the material) by a thermal wetting protocol. Once wetted, the capillarity and permeability to water of the materials remain irreversible regardless of the treatment to which they are subjected.

Applications of PolymBlend®

The properties of PolymBlend® make it very versatile for the preparation of a multitude of materials with applicability in many areas of knowledge. The applications of PolymBlend® are summarized in the following figure.



The properties of the materials obtained from PolymBlend® can be easily modulated.

This product is for research use only and it is not intended for use in humans or for in vitro diagnostic use.