

Hydrophilic vs Hydrophobic Membrane

One of the first and most fundamental points when it comes to the filtration of a medium is the correct choice of membrane type. It is important to define the lowest common denominator - liquid or gas = hydrophilic or hydrophobic.

- **Hydrophilic** membranes → Filtration of **liquid** substances
- **Hydrophobic** Membrane → Filtration of **gas** substances

Hydrophilic Membrane

Membranes are described as hydrophilic if they are used for liquid filtration due to their properties.

The most common are currently:

- **Polyethersulfone membranes (PES)**
- **Polyvinylidene fluoride (PVDF)**

Other available membrane materials are cellulose acetate (CA), regenerated cellulose (RC) and nylon. The distribution of CA, nylon and PVDF in particular is almost exclusively attributed to the three major filter manufacturers.

Depending on the pore size of the hydrophilic membrane, the range of applications extends from bioburden reduction to sterile filtration and virus filtration.

Hydrophilic membranes are therefore in contact with the product and are a critical component of every process. When selecting a membrane, a wide variety of criteria must be taken into account, and how these are ranked is up to the user. For us as a filtration supplier, throughput, availability and cost-effectiveness are the most important factors.

The analytical evaluation of the filtrate is carried out by the customer as part of an internally defined process.

Hydrophobic Membrane

Hydrophobic membranes are used in the filtration of gas substances.

The so-called PTFE membrane is mainly used.

- **Polytetrafluoroethylene membranes (PTFE)** → **high strength**
→ **high chemical compatibility**

The combination of strength and chemical compatibility characterizes the functionality of this diaphragm. Typically, the maximum differential pressure is specified for forward and reverse use. In contrast to liquid filtration, which is critical because it comes into contact with the product, PTFE has been established as a membrane type by all filter suppliers for many years. This ensures very good availability. Other membrane materials are hydrophobic PVDF. In contrast to any other application in liquid filtration, hydrophobic membranes are also used against the direction of flow. A typical application is the aeration and deaeration of containers (e.g. fermenters).

Important Note for PTFE Membrane Filters

Wetting of the hydrophobic membrane with liquid must be prevented at all costs.

Many PTFE sterile air filters are used for fermenter supply and exhaust air, so the formation of condensate and/or foaming of the fermentation medium is a given and must of course be prevented.

The following solutions have proven themselves in practice:

- In the event of condensate formation (= wetting of the hydrophobic PTFE membrane with liquid), the **use of a filter housing heater** is the best solution.
- If the fermenter frequently foams over, causing the hydrophobic PTFE membrane to block, a **polypropylene prefilter** may be a solution.

Key Message

The choice of whether to use a hydrophilic or hydrophobic membrane is one of the first fundamental decisions in a filtration application.

Wetting a hydrophobic membrane with liquid must be prevented, as this immediately leads to blockage.