

# HydroPE Hydrophilic polymer

HydroPE is a polymer material for injection molding and extrusion. The unique feature of HydroPE is that the molded devices are hydrophilic directly from the molding machine or the extruder. No coating or plasma processes are needed.

HydroPE can be used for a number of applications but is developed for single use medical devices.

## HydroPE features

- Devices are hydrophilic directly from the molding machine.
- HydroPE is delivered in pellet form ready for use.
- Can be used with standard injection molding machines and standard extruders.
- Long functional life (10+ years) thus easily supporting a 2 year shelf life of a device.
- HydroPE devices are tolerant to storage without temperature control.
- Biocompatible

## Material compatibility

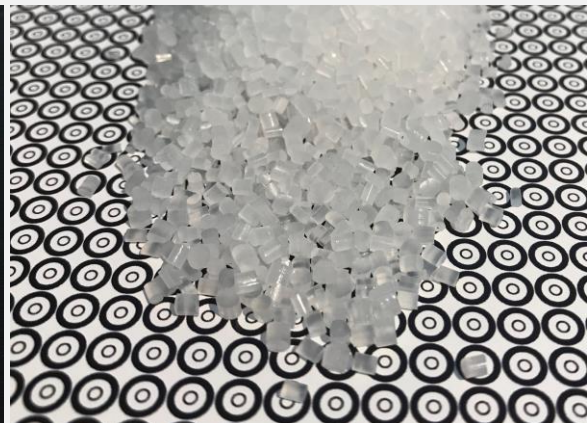
HydroPE is compatible with most materials, but there are substances it is not compatible with. These include; Chlorine, Hypochlorides, Peroxides, Ozone etc. These are all very reactive substances, and these may inactivate the HydroPE surface, so it is no longer hydrophilic.

## Optical properties

HydroPE have optical properties very much like pure PE, except for a very faint yellow tone. HydroPE is scattering, hazy white and for thin sections it is translucent.



*HydroPE pellets on a black background*



*HydroPE pellets on a structured white background*

## HydroPE hydrophilic characteristics

### Contact angle

Depending on the process parameters and the part design, contact angles for HydroPE is between 10° and 20°. This is enough to ensure; fast and stable capillary flow, prevention of air bubbles, printability etc.

### Hydrophilic comparison

- |                            |        |                           |
|----------------------------|--------|---------------------------|
| • PMMA/Acrylic             | CA=73° | $\cos(73^\circ) = 0.2924$ |
| • P100 hydrophilic coating | CA=10° | $\cos(10^\circ) = 0.9848$ |
| • HydroPE                  | CA=15° | $\cos(15^\circ) = 0.9659$ |

The cosine to the contact angle is a measure of how fast capillary flow will be. HydroPE will thus flow fast and controlled, but not as fast as if the device had a P100 coating.

### Reference for cosine to the contact angle

- |          |  |
|----------|--|
| 0.25-0.3 | The "capillary friction" of a channel. The threshold for capillary flow.         |
| 0.70     | Medium speed and highly stable capillary flow.                                   |
| 0.90     | Fast and stable capillary flow.  |
| 0.98     | Very fast flow. For some designs this may be too hydrophilic, and thus unstable. |
| 1.00     | Very fast and uncontrolled capillary flow. Very likely to trap air bubbles.      |

## Functional life of HydroPE

Unlike many hydrophilic treatments, a device molded in HydroPE will maintain the hydrophilic property for a very long time.

An accelerated functional life study (ASTM-F1980) has been made in normal humid air. No degradation can be measured over the effective 10 years of the study.

Until we have years of real-time stability data, we recommend storing devices made in HydroPE in a dry atmosphere.



## Processing guidelines

HydroPE is based on polyethylene and can be processed using the standard settings for PE on injection moulding machines and extruders.

### Temperature settings

Zone 1 / Rear	30°C - 50°C
Zone 2 / Center	160°C - 200°C
Zone 3 / Front	200°C - 220°C
Zone 4 / Nozzle	200°C - 230°C
Mold	20°C - 60°C

The best results are achieved by high speed injection, medium pressure and long cooling time.

These settings are not specifications and should be seen as a starting point for optimization on your specific molding or extrusion machine.

### Release agents

Do not use mold release agents, or add anything to the HydroPE material. Release agents are often oily substances which will leave a very thin and invisible hydrophobic residue on the molded devices. The hydrophobic residue covers the HydroPE hydrophilic material, and the device thus becomes hydrophobic. **Do not use mold release agents!**

## Storage, disposal and safety

### Storage

Store HydroPE devices and pellets dry and in sealed plastic bags. To avoid condensation of water on the HydroPE pellets, the material should be given time to reach room temperature before opening the plastic bags.

### Disposal

HydroPE may be included with other waste containing similar plastic materials to be discarded for destruction or reclaim in accordance with local state and federal regulations. It is the responsibility of the customer to ensure the disposal of HydroPE is made in observance of all applicable environmental regulations.

### Environmental, Health and Safety

HydroPE in both pellet and molded part form, is biocompatible and completely safe. No safety precautions are needed, but we don't recommend getting HydroPE dust into eyes/lungs or consuming it. Like any other plastic material, HydroPE will decompose very slowly in nature and thus accumulate. For this reason, HydroPE shouldn't be released in nature or other uncontrolled environments.

### Warranty

The information in this datasheet is based on our experience and is, we believe to be reliable, but may not be complete. We make no guarantee or warranty, expressed or implied, regarding the information, use, handling, storage, or possession of this product, or the application of any process described herein or the results desired, since the conditions of use and handling of the product is beyond our control.

