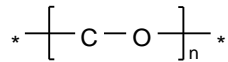


## Polyacetals / Polyoxymethylene (POM)

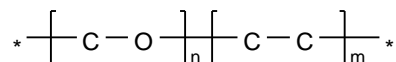
Polyacetals (POM's) are highly crystalline thermoplastics that have mechanical properties similar to nylon. They are among the stiffest and toughest thermoplastics<sup>i</sup>. There are two types of polyacetal readily used in injection molding: homopolymer and copolymer.

In general, both types of polyacetals have the following properties<sup>ii</sup>:

- ✓ Highly crystalline; due to no large pendant groups on the chain.
- ✓ High crystallinity leads to excellent strength, stiffness, surface hardness, barrier properties, solvent resistance, and a sharp melting point.
- ✓ High crystallinity also leads to reduced toughness and they are somewhat notch sensitive.
- ✓ Good slip and wear resistance<sup>i</sup>
- ✓ Normally not sensitive to polar solvents; hence low water absorption.
- ✓ Acetal is attacked by acids and strong oxidizing agents.
- ✓ Due to low molecular polarity, they have low bonding tendency and low coefficient of friction.
- ✓ Acetal is UV sensitive; chalking and degradation of the polymer occurs with exposure.



Acetal Homopolymer



Acetal Copolymer

Some comparative properties:

### Homopolymer

- Homopolymer (commonly Delrin) is made by polymerizing formaldehyde.
- 15% higher tensile strength
- 20% higher modulus
- 20% higher impact strength
- 20% higher surface hardness
- 20% higher fatigue limit.

### Copolymer

- Copolymer (commonly Celcon) is copolymerized with formaldehyde and ethylene oxide.
- Increased thermal stability; due to the C-C bond.
- More flexibility
- twice the elongation
- 20% less water absorption.

Additives are available for polyacetals. Here is a short listing of some of the additives and their effects:

- Adding short fiberglass will enhance strength and toughness.
- Mixtures with fluorocarbons lead to good surface lubricity to prevent creaking<sup>i</sup>.
- Increase stiffness and strength; add 10-40% glass fiber, glass beads or other mineral fillers.
- For thin-walled parts – crosslinked rubber can be added to improve melt flow in the tool.
- Improved electrical conductivity and heat distortion point is obtained by adding powdered aluminum or bronze.
- Polyacetals have high mold shrinkage – warp<sup>iii</sup>. Adding talc filler (or other heat sinking inorganic filler) will reduce the amount of warp; however, it is at the cost of reduced impact strength.

<sup>i</sup> Osswald, et al, *International Plastics Handbook*, Hanser, 2006.

<sup>ii</sup> Strong, A. Brent, *Plastics: Materials and Processing*, Prentice Hall, 2000.

<sup>iii</sup> Campo, E. Alfredo, *The Complete Part Design Handbook*, Hanser, 2006.