Your Clear Advantage
TOPAS Advanced Polymers produces an innovative line of polyolefin materials used for a wide range of applications in the automotive, appliance, medical, information technology, communications, consumer and industrial sectors. TOPAS Advanced Polymers believes that a key element in marketing these materials is to provide application development and technical support to its customers on a global basis.

TOPAS® COC

The company’s most important product is its family of TOPAS® COC resins. These amorphous polymers allow innovative application development not feasible with other materials. TOPAS® COC offers high transparency, outstanding moisture barrier, high rigidity and strength, excellent biocompatibility and good electrical properties. This unique combination of properties has opened up TOPAS® COC applications in such diverse areas as medical devices, food and pharmaceutical packaging, optics and toners.

NORBORNENE

Another important product of TOPAS Advanced Polymers is norbornene, a bicyclic olefin, which is the main building block in the polymerization of TOPAS® COC. It has many other uses, such as in pharmaceutical intermediates, pesticide compounds, specialty fragrances and high-damping rubber. With an annual production capacity of 21,000 metric tons of high-purity norbornene, the company is the largest supplier of this useful chemical intermediate.
TOPAS® COC exhibits a unique combination of properties, which can be customized by varying the chemical structure of the copolymer. Performance benefits include:

- Low density
- High transparency
- Low birefringence
- Extremely low water absorption
- Excellent water vapor barrier properties
- Adjustable heat deflection temperature up to 170 °C
- High rigidity, strength and hardness
- Excellent biocompatibility
- Very good melt processability/flowability
- High resistance to acids and alkalis
- Very good electrical insulating properties

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8007</td>
<td>Clear grade with a heat deflection temperature (HDT/B) of 75 °C. It is especially suitable for packaging moisture-sensitive products because of its low water absorption and very good barrier properties. Grade 8007 has a lower elastic modulus and higher elongation than other TOPAS® COC grades.</td>
</tr>
<tr>
<td>5013</td>
<td>Clear grade with a heat deflection temperature (HDT/B) of 130 °C. This grade is characterized by high flowability and excellent optical properties. Recommended for applications such as optical parts, e.g., lenses, and optical storage media, where low birefringence and high molding accuracy (pit replication) are essential, as well as for medical and diagnostic applications.</td>
</tr>
<tr>
<td>6013</td>
<td>Clear grade with a heat deflection temperature (HDT/B) of 130 °C. Its combination of high purity, chemical resistance, high transparency and high HDT/B makes this material useful for products such as labware. Parts made from 6013 can be gamma- and steam-sterilized.</td>
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<tr>
<td>6015</td>
<td>Clear grade similar to 6013, with a heat deflection temperature (HDT/B) of 150 °C, a value which cannot be attained by many amorphous polymers.</td>
</tr>
<tr>
<td>6017</td>
<td>Clear grade with a heat deflection temperature (HDT/B) of 170 °C. For parts requiring resistance to short-term, high-temperature exposure.</td>
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</table>
COMPANY PROFILE

TOPAS Advanced Polymers manufactures and markets TOPAS® COC (cyclic olefin copolymer) for advanced packaging, medical, optical and other applications worldwide. In addition, TOPAS Advanced Polymers manufactures and markets norbornene, a valuable building block for complex organic molecules.

TOPAS Advanced Polymers is a joint venture between Daicel Chemical Industries Ltd., and Polylastics Co., Ltd. It is headquartered in Frankfurt, Germany, with a US subsidiary in Florence, KY. It operates a 30,000 metric tons/year COC plant, the world’s largest, in Oberhausen, Germany. It employs about 100 people working in research and development, marketing and sales, production and administration. TOPAS Advanced Polymers was launched on January 1, 2006 following the purchase of the TOPAS business from Ticona, a subsidiary of Celanese Corporation. TOPAS® COC was developed in the early 1990s by Hoechst AG. Hoechst created a new COC process in which norbornene is synthesized from dicyclopentadiene and ethylene. A second step copolymerizes norbornene with ethylene by metallocene catalysis to generate cyclic olefin copolymer.

QUALITY MANAGEMENT

TOPAS Advanced Polymers is committed to meeting the highest quality, environmental, health and safety requirements worldwide. This commitment means that the company constantly updates its management system certifications. Important certifications obtained by the company include: ISO 9001:2000.

LOCATIONS

TOPAS Advanced Polymers Inc.
Florence (Kentucky, US):
M&S North America, film laboratory

TOPAS Advanced Polymers GmbH
Frankfurt (Germany):
Headquarters; R&D, M&S Europe Oberhausen (Germany):
Production site

Polylastics
Tokyo (Japan):
M&S Sales Asia/Pacific, R&D
### HISTORY

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
<th>Company</th>
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<td>1990</td>
<td>Project in Central Polymer Research</td>
<td>Hoechst AG</td>
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<tr>
<td>1996</td>
<td>Pilot plant at Hoechst – development of metallocene-COC process</td>
<td>Hoechst AG</td>
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<tr>
<td>2000</td>
<td>Production plant on stream, market development for segments</td>
<td>Ticona (Celanese)</td>
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<tr>
<td>2006</td>
<td>Business acquired by DAICEL and POLYPLASTICS</td>
<td>Daicel Ltd. Polyplastics, Co., Ltd.</td>
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### COMPANY OWNERSHIP DATA

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<table>
<thead>
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<tr>
<td>Polyplastics</td>
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<td>Daicel</td>
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<table>
<thead>
<tr>
<th>Company</th>
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<tbody>
<tr>
<td>TOPAS Advanced Polymers GmbH</td>
<td>100%</td>
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<tbody>
<tr>
<td>TOPAS Advanced Polymers, Inc.</td>
<td>100%</td>
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</tbody>
</table>
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MEDICAL
The dynamic and innovative medical technology sector calls for high-performance materials. TOPAS® COC offers:
• Superior moisture barrier and low moisture absorption
• Easy thermoformability
• High rigidity and strength
• Dimensional stability
• Excellent purity and low extractables
• Resistance to hydrolysis and many acids, bases and polar organic solvents
• High light transmission, even into the near UV range
• Compatibility with common sterilization methods
• Compliance with appropriate USP Class VI, ISO 10993 compatibility tests and FDA regulations. It also has active US FDA Drug and Device Master Files

OPTICAL
For advanced optical applications, including flat panel displays and lenses, TOPAS Advanced Polymers offers several specially engineered optical grades of its TOPAS® cyclic olefin copolymer.
• Low water uptake
• Low birefringence
• Very good metallizability
• High surface replication
• High-temperature resistance
PACKAGING

The packaging market imposes a broad range of demands on product designers. Criteria such as package appeal, durability and function are all critical, and recyclability is playing an increasingly important role. TOPAS® COC ethylene copolymers represent a major step forward in polymer technology, enabling package developments and enhancements that were simply not feasible before the arrival of this new resin on the packaging scene.

TOPAS® can enhance packaging materials in numerous areas, including:

- Moisture barrier (WVTR)
- Downgaging
- Thermoformability
- Sealing layer
- Transparency
- Film density
- Metallization

- Controlled tear
- Stiffness
- Heat resistance
- COF and blocking
- Controlled shrinkage
- Dimensional stability
BLENDs AND COMPOUNDS WITH POLYOleFINS

The addition of TOPAS® COC grades during the production process offers an opportunity to significantly broaden the property spectrum of polyolefins. This approach is widely used in film manufacture.

High-Tg COC grades can also be blended with polypropylene homo- and copolymers to produce new compounds with a property profile, extending into the engineering polymer range.

The effects of compounding TOPAS® COC grades with a Tg above 100 °C into PE or PP include:

- Significant increase in tensile modulus
- Less tendency to creep under load at elevated temperatures
- Higher heat deflection temperature
- Improved water vapor barrier
- Lower warpage
- Reduced impact strength
# CONTACTS

## CONTACT OUR SPECIALISTS!

<table>
<thead>
<tr>
<th>NAFTA</th>
<th>EUROPE &amp; South America</th>
<th>ASIA</th>
</tr>
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<tbody>
<tr>
<td><strong>TOPAS Advanced Polymers, Inc.</strong></td>
<td><strong>TOPAS Advanced Polymers GmbH</strong></td>
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</tr>
<tr>
<td><strong>EMERGING MARKETS</strong></td>
<td><strong>MEDICAL</strong></td>
<td><strong>OPTICAL</strong></td>
</tr>
<tr>
<td>Timothy Kneale</td>
<td>Wilfried Hatke</td>
<td>Hirozumi Shimomura</td>
</tr>
<tr>
<td>Ph. +1-859-746-6447 ext 4401</td>
<td>Ph. +49 (0)69-305-46756</td>
<td>Ph. +81-3-6711-8615</td>
</tr>
<tr>
<td><a href="mailto:timothy.kneale@topas-us.com">timothy.kneale@topas-us.com</a></td>
<td><a href="mailto:wilfried.hatke@topas.com">wilfried.hatke@topas.com</a></td>
<td><a href="mailto:hirozumi.shimomura@polyplastics.com">hirozumi.shimomura@polyplastics.com</a></td>
</tr>
<tr>
<td><strong>Barbara Canale</strong></td>
<td><strong>Michael Grimm</strong></td>
<td><strong>Shigeki Shinogi</strong></td>
</tr>
<tr>
<td>Ph. +1-859-746-6447 ext 4408</td>
<td>Ph. +49 (0)69-305-46757</td>
<td>Ph. +81-3-6711-8615</td>
</tr>
<tr>
<td><a href="mailto:barbara.canale@topas-us.com">barbara.canale@topas-us.com</a></td>
<td><a href="mailto:michael.grimm@topas.com">michael.grimm@topas.com</a></td>
<td><a href="mailto:shigeki.shinogi@polyplastics.com">shigeki.shinogi@polyplastics.com</a></td>
</tr>
<tr>
<td><strong>Ronald Lamonte</strong></td>
<td><strong>Joerg Strack</strong></td>
<td><strong>Yoshihito Tsukamoto</strong></td>
</tr>
<tr>
<td>Ph. +1-859-746-6447 ext 4410</td>
<td>Ph. +49 (0)69-305-46755</td>
<td>Ph. +81-3-6711-8615</td>
</tr>
<tr>
<td><a href="mailto:ronald.lamonte@topas-us.com">ronald.lamonte@topas-us.com</a></td>
<td><a href="mailto:joerg.strack@topas.com">joerg.strack@topas.com</a></td>
<td><a href="mailto:yoshihito.tsukamoto@polyplastics.com">yoshihito.tsukamoto@polyplastics.com</a></td>
</tr>
<tr>
<td><strong>Randy Jester</strong></td>
<td><strong>Wolfram Goerlitz</strong></td>
<td><strong>Naohiro Kato</strong></td>
</tr>
<tr>
<td>Ph. +1-859-746-6447 ext 4409</td>
<td>Ph. +49 (0)69-305-46760</td>
<td>Ph. +81-3-6711-8615</td>
</tr>
<tr>
<td><a href="mailto:randy.jester@topas-us.com">randy.jester@topas-us.com</a></td>
<td><a href="mailto:wolfram.goerlitz@topas.com">wolfram.goerlitz@topas.com</a></td>
<td><a href="mailto:naohiro.kato@polyplastics.com">naohiro.kato@polyplastics.com</a></td>
</tr>
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### DETAILS

**TOPAS Advanced Polymers GmbH**
Industriepark Höchst · Gebäude F821
65926 Frankfurt · Germany
Phone: +49 (0)1805-1-86727
Email: info@topas.com
www.topas.com

**TOPAS Advanced Polymers, Inc.**
8040 Dixie Highway
Florence, KY 41042 · USA
Phone: +1-859-746-6447
Email: info@topas-us.com
www.topas.com

**Polyplastics Co., Ltd.**
JR Shinagawa East Building, 13F
18-1 Konan 2 - Chome, Minato-Ku
Tokyo, 108-8280 · Japan
Phone: +81-3-6711-8615
Email: topas.info@polyplastics.com
www.polyplastics.com