

## PolymerPlace Notes

*A plastics technology newsletter*

By Margaret Baumann, G.H. Associates

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### HIGHLIGHTS THIS MONTH

- The Society of Plastics Engineers held their Annual Technical Conference in Chicago, IL May 16-20, 2004. PolymerPlace partners Maggie Baumann and Roger Jones presented papers during the Marketing & Management Division Session that was heavily attended.
  - Maggie Baumann's "The Impact of Biotechnology, Nanotechnology, and the Environment on the Chemicals and Plastics Industries"
  - Roger Jones' "Surviving Globalization"
- GH Associates has announced that it is undertaking a multiclient study titled "*The Global Nylon Industry 2004.*"
- G.H.Associates attended the World Congress on Industrial Biotechnology April 20-22 in Orlando FL.

### POLYMER END-MARKETS

- **Construction:** Premier Material Concepts have recently developed a unique thermoplastic rubber (TPE) material for providing reliable insulation protection from weather in outdoor applications.
- **PACKAGING:** A new family of multilayer, barrier films produced by Flexopack S.A. in Koropi, Greece, provides the stiffness, transparency and thermal resistance needed in lidding and flow packs for fresh and processed meat, cheese and other foodstuffs.
- **ELECTRONICS** In switching co-ax connector for a Siemens cellular phone, engineers at Tyco Electronics faced some challenges,

### POLYMER/MATERIAL DEVELOPMENTS

- **DuPont and Tate & Lyle PLC** announced a joint venture to create products from renewable resources such as corn for numerous applications including clothing, interiors, engineered polymers and textile fibers.
- **Kuraray** has used its proprietary catalyst technology to develop the world's first manufacturing process for an acrylic thermoplastic elastomer which offers excellent transparency and weather resistance.

- Specialty compounder **RTP Company** introduces advancements in high gravity compounds (HGC) for lead replacement applications that typically fall within density ranges of 5 to 11 gm/cc. These heavy-weighted HGC's provide improved processing capabilities for manufactures of lead replacement products with increased lot-to-lot material consistency and superior consistency within lots when compared to other HGCs.

### **What's New at Polymerplace.com.**

We have been busy this past month. In addition to presenting papers at ANTEC we also attended a conference on Industrial Biotechnology.

The Society of Plastics Engineers recently held their Annual Technical Conference in Chicago, IL May 16-20, 2004. PolymerPlace partners Maggie Baumann and Roger Jones presented papers during the Marketing & Management Division session that was heavily attended.

**Maggie Baumann's "The Impact of Biotechnology, Nanotechnology, and the Environment on the Chemicals and Plastics Industries"** dealt with how "disruptive technologies," are creating significant new market opportunities, but perhaps even more importantly, are forcing changes in how industry conducts business. While a number of biotechnologies have been in use for over 50 years (e.g., nylon intermediates from corn), a number of newer ones have been under development by academia, government, and industry in the search by industry for ways to reduce our dependence on petroleum and create fewer or more benign byproducts to be used in place of more conventional chemical manufacturing processes. However, the economics have been complex for these processes but a lot of progress has been made to reduce the costs to manufacture these biorenewable products.

Nanocomposites and nanochemistry are now being commercialized today and are on the upward slope of the demand curve, ensuring that they will become an increasingly important area for industry in the near future. A copy of the paper is available. [Please go to http://www.polymerplace.com](http://www.polymerplace.com) ).

**Roger Jones' "Surviving Globalization"** was the first of four papers on this subject. He showed how the seeming catastrophic loss of manufacturing jobs in the plastics industry in 2000-2002 was the result of both the unusual recession of the same time period and the 30-year ongoing reduction in manufacturing jobs around the world that is the result of continuous productivity improvements. Other materials have shown far greater job losses than plastics during the same period – even China has lost more manufacturing jobs in the past ten years than have been lost in the US. US Government mandates in the form of corporate taxes, employee benefits, environmental compliance, and lawsuit costs are the highest in the world, costing more than \$5/hour per worker. Finally, he listed the ways successful companies are not just surviving but thriving in the globalized

world of trade, using illustrations from his book, "Strategic Management for the Plastics Industry."

If you are interested in a copy of [Roger Jones' presentation](#) please go to:

<http://www.polymerplace.com>

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[GH Associates](#) has announced that it is undertaking a multiclient study titled "*The Global Nylon Industry 2004*." The study will build regional details into a global structure of this important segment of the plastics industry by polymer producers, compounders, distributors, and end users. Principal sections will include the following:

1. An analysis of nylon polymer producers and capacities, by nylon type, locations, integration, business strategies, and announced future plans.
2. An analysis of nylon compounders and their business strategies, ranked according to size.
3. An analysis of nylon distributors and their business strategies, ranked according to size.
4. An analysis of the principal end use markets, segments, size and growth rates, and trends; this will include multifilament and monofilament fiber, as well as film markets.
5. An analysis of the principal end users, size and growth rates, and trends.
6. Regions/countries included are NAFTA (USA, Canada, and Mexico), Mercur (Argentina and Brazil), EU (including the new members in Eastern Europe), Russia, Japan, China, India, and SE Asia (S. Korea, Taiwan, Thailand, Malaysia, and Singapore).

Clients may purchase the complete study for \$20,000 through September 1, 2004, and thereafter for \$25,000. Modules by region or market are available and will be priced on request. The planned completion date for the study is November 30, 2004 (based on the receipt of a minimum number of subscriptions). For a copy of the prospectus or for more information e-mail us at [info@polymerplace.com](mailto:info@polymerplace.com) or call 908-832-2207.

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### **Biotechnology**

G.H. Associates attended the [World Congress on Industrial Biotechnology](#) April 20-22 in Orlando FL. Although we had done work in the area of biorenewable materials in the past, we did not realize the progress that has been made in industrial biotechnology. Developments in medical and agricultural biotechnology have contributed robust techniques and technologies that have contributed to industrial biotech. Experts predict that by 2010, 10-15% of all chemicals and polymers will be biobased. Recognizing the significance of this emerging field, we are launching a biotechnology newsletter that will track important developments in industrial biotechnology with particular emphasis on polymeric

materials, processes and applications. We believe that with the current surge in energy prices, the area of industrial biotechnology will continue to get more attention from large chemical companies. We will publish the inaugural issue in late June, 2004. Please sign up for the inaugural issue. Please go to <http://www.polymerplace.com> to sign up. The first issue is free; the annual subscription is \$49.00 for 6 issues.

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With the current high gas prices you might be interested in knowing that there is a growing production base for biofuels. Motorists may not be filling up with corn stalks when they pull into a gas station in a few years, but they will be driving cars fueled in part by plant-based bioenergy. Advances in industrial biotechnology are making it possible to increase the amount of agricultural products and waste materials that can be converted to transportation fuels. This means the biotech industry, in partnership with farmers, energy companies and transportation interests, can forge a future with greater energy security. Most Americans are aware of the domestic ethanol industry, which converts corn kernels into ethanol that is added to gasoline. But the bigger promise of fuel farming has gone untapped. By using different bioenergy feedstocks, we can reduce oil consumption and carbon dioxide emissions while breathing new economic life into the farm sector.

The major breakthrough for the production of energy will come from companies that are perfecting enzymes to cost effectively convert cellulose – the tough material in plant cell walls to sugars. Currently, ethanol is produced using the starch from the corn kernel, as opposed to the woody(cellulosic)material in the stalk and leaves. Conversion of cellulose to sugar and then ethanol will allow these and other agricultural waste products to be processed into ethanol.

The economic impact could be huge. The ethanol industry, principally using corn, produced 1.6 billion gallons of ethanol in 2000, or slightly more than 1 per cent of all US gas consumption. Using enzymes to convert agricultural waste containing cellulose could increase ethanol production by a factor of 10.

Unlike current ethanol production, ethanol from cellulose is considered “carbon neutral”-the carbopn dioxide it gives off is the same carbon dioxide that was taken in by the plants from the atmosphere as they grew. Using cellulosic biomass to make energy would also significantly reduce energy requirements needed to produce ethanol vs. current technologies.

Right now, companies are just beginning to build first-generation biorefineries to convert biomass into bioenergy. As more biorefineries sprout around the country, they will increase demand for biotech enzymes and for biomass feedstocks, leading to economies of scale. This development is good for the biotech industry, the agriculture industry, our energy situation and the environment. It also means farmers will be able to harvest two crops from every field- food and energy-or to shift production from food and textile crops to dedicated biomass crops that will be in demand as more biorefineries are built.

In the final analysis, the development of energy production through industrial biotechnology is a winning solution for everyone.

This appeared in the June/July 2003 issue of Bio News and was written by Brent Erickson, BIO's vice-president for industrial and environmental biotechnology.

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## **Polymer End-markets Construction**

Premier Material Concepts (PMC) of Findley Ohio are custom manufacturers of TPE, ABS, HIPS, PP and acrylics for thermoforming, POP display material, converters and custom fabricators. They have recently developed a unique thermoplastic rubber (TPE) material for providing reliable insulation protection from weather in outdoor applications.

A customer, Armacell, an advanced insulation and engineered foams company, wanted to improve the weatherability of their insulation for outdoor applications. Specifically they were interested in achieving UV protection and surface durability on ductwork and other exterior applications. Existing insulation systems needed to be painted with latex and mastic finishes which was not cost effective and did not function reliably over time. If not properly maintained the thermal performance of those products would invariably deteriorate.

PMC developed a sheet product for them.

Armacell's new product, ArmaTuff® 25, incorporates their exclusive Amaflex insulation laminated with a durable white TPE membrane extruded in sheet form by PMC then provided to a laminator to cap foam insulation. The closed cell nature of the Amaflex product offers exceptional water vapor transmission properties and the membrane provided by PMC protects the insulation outdoors without the need for painting. TPO products are known for excellent longterm outdoor weatherability and resistance to ozone, acid rain, most industrial pollutants and ultraviolet radiation. In addition to meeting or exceeding physical performance requirements, the TPE membrane provided by PMC also helped to accommodate important price point issues. Because the material has made the insulation system maintenance free, this provides a value-added solution for Armacell customers.

For more information, Contact:Eric Hausserman, 1-877-BUYPMC6: 419-425-8974 Email: [eric.hausserman@buypmc.com](mailto:eric.hausserman@buypmc.com)

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## **PACKAGING**

A new family of multilayer, barrier films produced by Flexopack S.A. in Koropi, Greece, provides the stiffness, transparency and thermal resistance needed in lidding and flow packs for fresh and processed meat, cheese and other foodstuffs.

This [new family of coextruded films, called FlexoHybar® COC barrier films](#), uses a Topas® cyclic olefin copolymer (COC) layer to gain high modulus, transparency and improved moisture barrier. The layer eliminates the need to build stiffness by

laminating oriented films to the barrier-coextruded film, which reduces production steps and improves economics.

The new Flexopack films have as many as nine layers and control permeation to moisture, oxygen, odors and aromas. In addition to its high modulus,

transparency and moisture barrier, Topas<sup>®</sup> COC, which is made by Ticona, the technical polymer business of Celanese AG, provides excellent abuse- and puncture-resistance, important to the performance of lidding and flow-pack films.

“These new coextruded films have moduli of up to 1200 MPa, in the same magnitude as that of oriented films,” says Mr. Stamatis Ginosatis, managing director of Flexopack. “This means we do not have to laminate our film to oPP, oPA or oPET films.”

“By combining barrier and stiffness in our structure, we make FlexoHybar<sup>®</sup> CO films in a single, coextruded operation rather than in two or three processing steps. The result is a film having excellent economics for use in surface-printed and unprinted lidding for thermoformed rigid or semi-rigid combinations in modified atmosphere packaging.” FlexoHybar<sup>®</sup> CO coextruded films also are available with excellent anti-fog properties.

Topas<sup>®</sup> is a COC polymer which is approved for food-contact applications, e.g. flexible packaging, in Europe and the USA, they are also used in pharmaceutical blister packaging, injection-molded precision optics, medical and laboratory containers, and toner binder resins for color laser printers.

For information on Flexopack’s new Topas<sup>®</sup> COC-based, FlexoHybar<sup>®</sup> CO films and other products, contact: Flexopack S.A., 194 000 Koropi-Attiki, Greece. Phone: +30-210-66-80-000. Fax: +30-210-66-26-583. E-mail [info@flexopack.gr](mailto:info@flexopack.gr) . Or visit: <http://www.flexopack.gr> . As the leading flexible packaging manufacturer in Greece, Flexopack has a strong technical base in extrusion, bag-making and printing. Its products include thermoforming films, barrier and high barrier FFS films and films for liners, vacuum skin packaging, vacuum pouches and tubes, lamination films and high barrier shrink bags.

For information on Topas<sup>®</sup> COC, contact: Ticona GmbH, Professor-Staudinger-Straße, D-65451 Kelsterbach, Germany. Phone: +49-(0)180-584-2662 (DE) or +49-(0)693-051-6299 (EU). Email: [infoservice@ticona.de](mailto:infoservice@ticona.de) . In North America, contact: Ticona, 90 Morris Avenue, Summit, New Jersey, 07901, USA. Phone: 1-800-833-4882 or 1-908-522-7500. Email: [prodinfo@ticona.com](mailto:prodinfo@ticona.com) . Or visit <http://www.ticona.com>

## **ELECTRONICS**

In switching a co-ax connector for a Siemens cellular phone, engineers at Tyco Electronics faced some familiar challenges, i.e. boosting conductivity, shielding from interference, and dissipating static. To meet these requirements in a part with a surface area of only 3 square millimeters, Tyco selected a combination of materials for specific functions. Successive layers of metal were built up on a thermoplastic substrate for

conductivity, nickel as an anti-corrosive, and finally gold for solderability. Each layer needed to adhere to the thermoplastic substrate and be sent through a re-flow oven to complete a thermal bond to a printed circuit board.

Given these requirements, any plastic substrate that Tyco selected would have to withstand IR re-flow soldering temperatures of 300s F (150s C) while maintaining a dimensional tolerance of 0.015 in (0.38 mm). It would also need to be chemically compatible with the metal plating process. Because of its excellent dielectric properties and ability to withstand soldering temperatures, liquid crystal polymer (LCP) was recommended by custom compounder RTP Company as an excellent choice for the connector. Its unique coefficient of thermal expansion made it ideal for varying temperature and critical dimension use.

Tyco and RTP Company worked together to develop a specialty RTP 3400 Series platable LCP compound that also allowed overmolding to another unmodified LCP base material.

RTP Company, headquartered in Winona, Minnesota, USA, is a global leader in specialty compounding. The company has six manufacturing plants on three continents, plus sales representatives throughout North America, Europe, and Asia/Pacific. RTP Company's engineers develop customized thermoplastic compounds in over 60 different engineering resin systems for applications requiring color, conductive, flame retardant, high temperature, shielding, structural, and wear resistant properties. For more information call (800) 433-4787 or (507) 454-6900, or visit our website at <http://www.rtpcompany.com>.

Tyco Electronics is a global leader in the manufacture of automotive, communications, computer, and consumer electronics equipment. For more information, visit their website at <http://www.tycoelectronics.com>.

*Source: RTP Company*

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## **POLYMER/MATERIAL DEVELOPMENTS**

Kuraray has used its proprietary catalyst technology to develop the world's first manufacturing process for an acrylic thermoplastic elastomer which offers excellent transparency and weather resistance.

Kuraray is building a pilot plant to facilitate confirmation of the technology and the creation of a market for this material.

This thermoplastic elastomer has the transparency and weather resistance of PMMA (polymethyl methacrylate), added to the elasticity and plasticity of rubber. These characteristics are expected to fit this material for a broad spectrum of applications, including those below.

- (1) Because of its low-pollution, solvent-free characteristics, it is ideal as a base polymer for high-performance adhesives
- (2) Its transparency, plasticity, and high flow properties suit it for use in various

molding materials. (3)Its characteristics as an acrylic make it suitable for use as a modifier for polar resins.

This material is responsive to demands for lower environmental impact at the time of manufacturing and use, as well as to the electronics industry's demand for higher performance (reduced pollution, improved heat resistance, etc.).

Research into the manufacturing of acrylic thermoplastic elastomers is in progress across the globe. However, existing methods required the use of cryogenic temperatures (-80 °C) and long periods for polymerization. These drawbacks were major barriers to the industrialization of acrylic thermoplastic elastomers.

Kuraray's development of a proprietary catalyst allowed the development of an industrially viable production polymerization process that proceeds at normal temperatures and with precision control of polymerization.

Source: Kuraray

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Specialty compounder RTP Company introduces advancements in high gravity compounds (HGC) for lead replacement applications that typically fall within density ranges of 5 to 11 gm/cc. These heavy-weighted HGC's provide improved processing capabilities for manufactures of lead replacement products with increased lot-to-lot material consistency and superior consistency within lots when compared to other HGCs.

With the advancements in HGC technology, RTP Company can formulate new grades with lower viscosity which results in improved flow during processing. Performance improvements are the most dramatic in the highest specific gravity materials which are typically in the density ranges of 9 to 11 gm/cc and are compounded with nylon. This technology has been expanded to improve viscosity in other resin systems, including thermoplastic polyurethane elastomer, polypropylene, and even PEEK.

RTP Company works closely with companies to develop high quality lead-free alternatives in the Automotive, Ammunition, Recreation, and Medical Industries. Typical applications include wheel weights, projectiles, fishing sinkers, and radiation shielding. In addition to lead replacement applications, RTP Company also develops HGCs for products that typically used metal for weight manipulation. Many of these products are sporting goods where density controlled compounds greatly improve the performance of bats, golf clubs, racquets, and footwear. Source: RTP Company

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DuPont and Tate & Lyle PLC announced May 26, 2004 a joint venture to create products from renewable resources such as corn for numerous applications including clothing, interiors, engineered polymers and textile fibers.

The new company – DuPont Tate & Lyle BioProducts, LLC – is equally owned by DuPont and Tate & Lyle and will be based in Wilmington, Del. The company plans to construct its initial commercial manufacturing plant adjacent to an existing facility in Loudon, Tenn., with startup scheduled for 2006. A pilot facility in Decatur, Ill. has been operating for several years.

The joint venture will use a proprietary fermentation and purification process developed jointly by DuPont and Tate & Lyle to produce 1,3 propanediol (PDO), the key building block for DuPont Sorona® polymer. As DuPont's newest polymer platform, Sorona® offers unique properties such as stain-resistance, exceptional softness, comfort stretch and recovery, and UV- and chlorine-resistance when compared to polyester and nylon. Sorona® can be used in a variety of applications including textile apparel, interiors, engineering resins and packaging. The new bio-based technology uses less energy and employs renewable resources – replacing the need for traditional petrochemicals now used to produce 1,3 propanediol (PDO).

"As a science company, DuPont is committed to business and research initiatives that meet customer and market needs while delivering both shareholder and societal value," said John Ranieri, vice president and general manager – DuPont Bio-Based Materials. "Sorona® is an excellent example of putting science to work by integrating biology with materials science. Sorona® combines the emerging discipline of metabolic engineering (the capability for biology to produce valuable products) with the leading polymer engineering capabilities of DuPont."

"The joint venture is further evidence of Tate & Lyle's strength in innovation, our success in developing key industrial partnerships and our ability to generate value-added product growth. It is a natural fit with our core skills in fermentation of natural products," said Iain Ferguson, chief executive – Tate & Lyle PLC.

"Partnerships are an important component of our strategy to build our business and we are delighted that our relationship with DuPont continues to advance. This is also a good example of the excellence of Tate & Lyle's research and development capability in delivering a product from renewable resources that can selectively replace those made from petrochemicals."

John D. Halberstadt of DuPont has been named president of the joint venture. He will report to a board of managers with representatives from both parent companies.

Sorona® is currently manufactured from petroleum-based PDO, and is available commercially from DuPont. It is used to produce clothing and fabrics with superior softness, dyeability, and a natural stretch. Bio-PDO™ corn-derived chemical and Sorona® polymer made from Bio-PDO™ will be available in 2006. Last year, the U.S Environmental Protection Agency presented DuPont with its annual "Presidential Green Chemistry Award" for the company's research leading to the development of the bio-PDO process.

Tate & Lyle is a world leader in ingredients. Its core competence is to take corn, wheat or sugar, and add value to these raw materials through technology. As a result of continuous innovation, it offers an ever-wider product portfolio of versatile and functional ingredients. These products include Cereal Sweeteners, Starches, Sugars and Citric Acid. Tate & Lyle products have wide applications in the food, beverage, pharmaceutical, cosmetic, paper, packaging and building industries. With headquarters in London, Tate & Lyle operates more than 40 plants in 24 countries, almost all in Europe and the Americas. It employs 6,700 people in its subsidiaries with a further 2,800 employed in joint ventures. Sales in

the year ending March 31, 2003, totalled £3,167 million. More details are available on this website: <http://www.tateandlyle.com>

For more information on DuPont go to <http://www.dupont.com>.

**References:** The stories in *PolymerPlace Notes* come from a variety of sources including Company Press Releases, Interviews, and trade publications, e.g. *Plastics News* and newswires.

**PolymerPlace.com**

<http://www.Polymerplace.com>

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