KOSTRATE ®

Alternative Clear Engineering Plastics

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Business Dev Manager
July 2008

psg Plastic Selection Group, Inc.

PolyOne

KOSTRATE ® EDGE
"FILLING THE GAP"

TOUGH = ASTM ..Tensile Strength, Elongation and Unnotched Izod

Brittle Clears

"GAP"

Engineered Clears

(Rigid / Ductile / Tough)

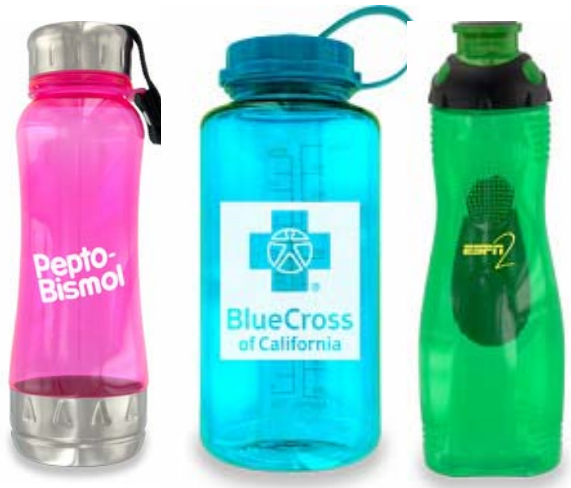
GPPS
SAN
ACRYLIC
SMMA

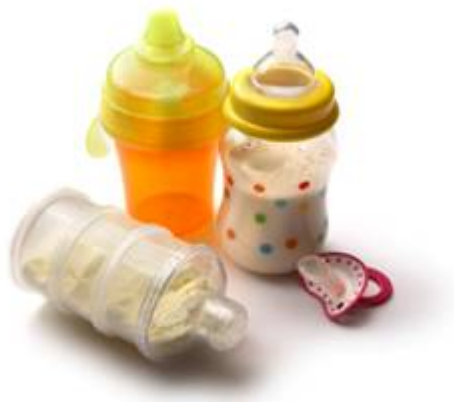
Kostrate® Edge
(Terpolymer)
1.Acrylic
2.Butadiene
3.Styrene

PC
POLYESTER
CLEAR ABS
RIGID CLEAR PVC

BOTTLE GRADES : IBM/ ISBM

Grades
Kostrate® Edge High Rigidity
Kostrate® Edge High Rigidity Modified
Kostrate® Edge 6535
Kostrate® Edge 6535M
Kostrate® Edge 7030





VALUE OF KOSTRATE ® OVER

PC, PETG, Rigid Clear PVC, Impact Acrylic

Features	Benefits
NEW to the marketplace	• Grabs the attention of those looking for an alternative
Low Specific Gravity	• Use less material to produce the same output • Material cost savings
Low Processing Temperature	• Faster mold cycle • Less power consumption • Less wear on machinery • Greater machine productivity
No DRYING required	• Lower manufacturing costs • Less electric usage • Less rejects due to improper drying, i.e. splay
Good Heat Deflection Temperature	• No crazing • Dishwasher safe
Good Chemical Resistance	• Viable for use in many different types of packaging applications

KOSTRATE ® OVER PC

PROPERTIES	UNITS	Kostrate® Edge (tailored formulation)	PC	Comment
Basic Properties:		Grade Dependent	Grade Dependent	
Specific Gravity	psf	1.01-1.04	1.2+	14+% better yield with Kostrate®
Cost/lb./kilo	dollars	**Based on list price, expect the advantage to favor Kostrate®**		
Tensile Strength Break	psi (lb/in ^{2})	3500-8000	8250-10400	Advantage PC
Flex Modulus	psi (lb/in ^{2})	220,000-380,000	300,000-340,000	**Kostrate® gives the advantage** of a tailored formulation to meet all needs
Elongation	%	30-250%	100-150%	**Kostrate® gives the advantage** of a tailored formulation to meet all needs
Rockwell hardness	Shore D	75-95	70-100	Similar-Grade Dependent
HDT at 66 psi - unannealed, .12	Deg, F	185F-200F (grade dependent)	269-280F	Advantage PC, **BUT** Kostrate has excellent dishwasher performance
Haze	%	0.5-1%	0-1%	Similar-Grade Dependent
Light Transmission	%	90-93%	90%	Similar-Grade Dependent
Mold Shrinkage	in/in	.003-.006	.005-.007	Similar
ESCR		Good	Excellent	ESCR testing should confirm use
Odor*		limited odor noted	Excellent	Advantage PC-air purging negates Kostrate® limited monomer odor which will dissipate if bottle is not *quickly* capped.
Processing:				
Drying	Hrs - °F	Not required	Minimum 3-5Hrs. @ 190-250F	**Kostrate® advantage.**
Suggested Molding Melt Temp.	Deg. F	380F-450F	600-650F	Potential cycle **advantage with Kostrate®**
Mold Temperature	Deg. F	70F-100F	180-240F	**Kostrate® advantage.**
****IN SUMMARY****				
Kostrate® has unit cost and important processing advantages as compared to any PC. The value of Kostrate® being tailored formulated for the needs of a specific application are a great advantage for the OEM and the processor.				

Bisphenol A Free

PSG Plastic Selection Group, Inc. PolyOne

OTHER KOSTRATE ® BENEFITS..

- **Dishwasher Safe**
  - **Passed 500 cycles in Rubbermaid test**

- **UV Stable**

- **Good Chemical Resistance**

KOSTRATE ® DISADVANTAGES..

- **Minor Odor**
  - **See packet for sheet on minimizing odor**
- **Heat Distortion Temperature**
  - **Can’t compete with PC**
- **Scratch**
  - **Due to the rubber component**

CONCERNS ABOUT BISPHENOL A

washingtonpost.com

Canada Bans BPA From Baby Bottles

By Lyndsey Layton and Christopher Lee
Washington Post Staff Writers
Saturday, April 19, 2008; A03

Canada yesterday became the first country to ban a widely found chemical from use in baby bottles, spurring a leading Democrat in the U.S. Senate to call for legislation that would prohibit use of bisphenol A, or BPA, in a number of everyday consumer products.

washingtonpost.com

Plastic Chemical Tied to Heart Disease and Diabetes

By Steven Reinberg
HealthDay Reporter
Tuesday, September 16, 2008; 12:00 AM

TUESDAY, Sept. 17 (HealthDay News) -- Bisphenol A (BPA), a chemical found in plastics that include baby bottles and packaging for food and beverages, may put people at risk for heart disease and type 2 diabetes, a new study concludes.

Wal-Mart Canada began pulling all baby products containing BPA from its shelves this week, and the chain said it plans to stop selling products containing BPA in U.S. stores by next year. Playtex said it would offer free non-BPA bottles to parents and will stop using BPA in all products by year's end. Nalgene, the maker of reusable water bottles that are popular among athletes, said yesterday it would discontinue production of bottles made with the chemical and recall existing products already in its stores.

CONCERNS ABOUT BISPHENOL A

Bisphenol A On Trial

Only an unbiased panel with appropriate expertise can resolve apparently **CONFLICTING RESULTS** of health studies

BETTE H LEMAN, C&EN WASHINGTON

IN INDUSTRIALIZED COUNTRIES, nearly everyone is exposed to bisphenol A (BPA), a weak synthetic estrogen. Most of the 3 billion to 3 billion lb produced in the U.S. each year is used to make polycarbonate food containers, baby bottles, refillable water containers, compact discs, and resins that line metal food and beverage cans. The Centers for Disease Control & Prevention has found measurable levels—0.4 to 8.0 parts per billion—of BPA in 95% of U.S. urine samples.

Although BPA is only one of thousands of synthetic chemicals the U.S. population encounters, it may be the most important for the developing fetus and perhaps young children. Every time children consume food or drink from a can, they are exposed to a small amount of BPA. Every time babies drink from clear polycarbonate plastic bottles, they ingest the chemical.

Because of this widespread exposure, researchers have conducted many studies of the health effects of low doses of BPA. Among government-funded experiments on lab animals and tissues, 152 found adverse effects and 11 did not. Contrarily, all 13 studies of BPA funded by chemical corporations reported no harm. The studies indicating harm report a variety of deleterious effects in rodent offspring exposed in the womb: abnormal weight gain, insulin resistance, prostate cancer, and excessive mammary gland development.

What can explain the vast discrepancies in the findings of government-funded and industry experiments? In a commentary in *Environmental Health Perspectives*, University of Missouri biologist Frederick S vom Saal points to several reasons low-dose studies failed to find adverse effects. One is the strain of rodent used. For example, two large industry-funded studies used the Sprague Dawley rat, a strain known to be insensitive even to strong, well-characterized estrogens, such as diethylstilbestrol. So it is not surprising that these rats show no response to the weaker estrogen BPA. Many other recent strains are far more sensitive, vom Saal wrote.

Another reason is that different batches of the feed used in several industry studies and Kinney's lab is estrogenic soybeans. Phytoestrogens, such as genistein in soy, as well as other estrogenic components, can be present in variable amounts in different batches, vom Saal reports. In some studies, estrogenic substances in the feed may have masked the effects of BPA, he says.

In light of the potential health effects of BPA exposure and the inconsistent study outcomes, it is especially important that an unbiased panel, with no conflicts of interest and a detailed knowledge of the field, evaluate the literature on BPA, consider the weight of evidence in regard to adverse effects, and choose valid studies to include in its report.

Risk is the reason for the recent outcry from environmental groups and lawmakers when they became aware that outside contractor Sciences International (SI) was deeply involved in the National Toxicology Program's assessment of BPA (*C&EN*, March 12, page 5). SI helped select the scientific panel, reviewed the literature, and wrote the original draft report—essentially a literature review—on BPA for NTP's Center for the Evaluation of Risks to Human Reproduction. SI has worked for two BPA manufacturers, Dow Chemical and BASF. NTP is housed at the National Institute of Environmental Health Sciences (NIEHS).

It would seem that a scientific literature review would be an objective, cut-and-dried exercise when conflicts of interest could have little influence. But reality is almost the opposite. For example, researchers in the field know that the biologically active fraction of total circulating BPA is the part that is not bound to plasma proteins, because protein-bound BPA cannot diffuse through cell membranes. So it is the levels of unbound BPA that must be compared when evaluating study results. But some sections of the original draft report on BPA compared results of studies that were measuring total BPA to those that were measuring only the unbound fraction, another source of bias in omission of critical information from a review.

Because BPA causes adverse effects in rodents that are similar to some of the health problems that have recently increased in human populations, many researchers believe BPA may be partially responsible. The incidence of human prostate cancer rose 85% from 1973 to 2002, and insulin resistance, which leads to type 2 diabetes, became a much more prevalent health problem. The incidence of childhood obesity has more than quadrupled over the past 40 years.

When newborn rats are exposed to low doses of BPA, they develop early-stage prostate cancer in adults. Low doses of BPA also cause insulin resistance in lab animals. Several of the most alarming studies released recently link obesity with BPA. After vom Saal and other researchers exposed pregnant rodents to low levels of BPA, their pups gained weight rapidly and stayed overweight for the rest of their lives, while the control animals grew normally.

A similar phenomenon has been observed recently in humans, says Jerry Heindel of the NIEHS. Some full-term infants gain weight abnormally fast and stay obese throughout childhood. He believes that in utero exposure to BPA, or to a mixture of environmental chemicals, may be playing some role in childhood obesity. High-calorie diets and lack of exercise are certainly important but may not be the only factors leading to excessive weight gain in children.

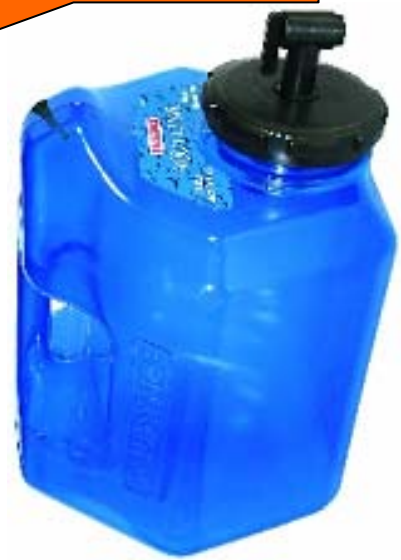
It seems urgent to investigate whether exposure to certain chemicals in the womb is one possible cause of prostate cancer, insulin resistance, and childhood obesity.

Views expressed on this page are those of the author and not necessarily those of ACS.

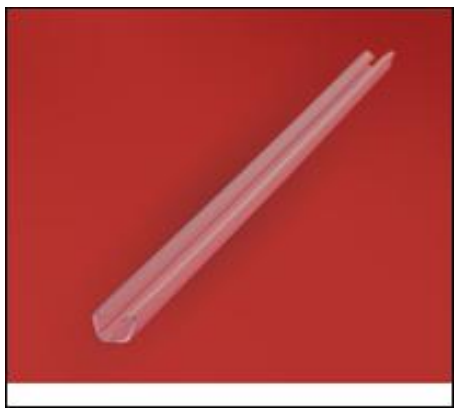
SAFE?!!

PROFILE AND BLOW MOLDING

Hollow Handle Bottles

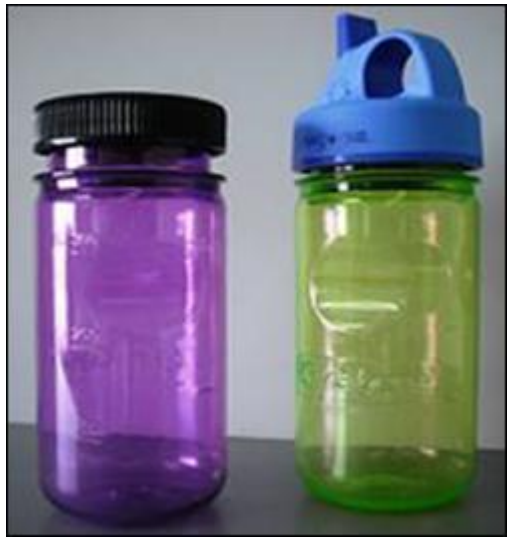


Kostrate® Edge has **replaced Polyester** in several hollow handle water bottle applications. Additionally, we have most recently went into production with a 4 gallon hollow handle water container shown to the right.



Price Channels

Kostrate® is replacing Rigid Clear PVC in many Price Channels and saving extruders thousands at the machine. Easier to process and No Drying required.

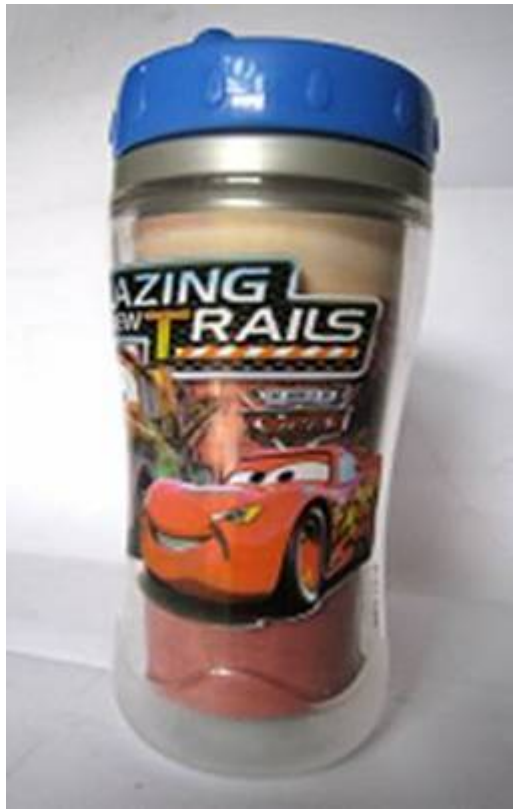


PSG has been working over the past year in **developing a clear, tough and rigid alternative to PC** in the **Sports water bottle** industry. A few of the custom tailored grades are that of Kostrate® Edge 6535 and 6535M.

Sports Water Bottles

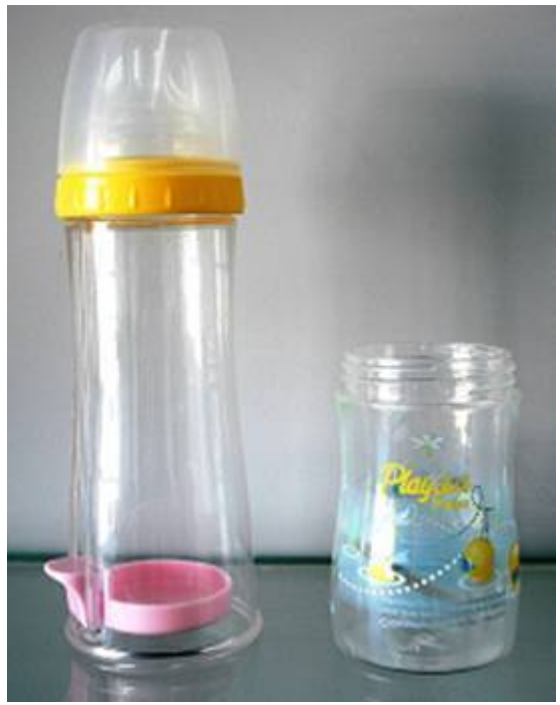
ASIA SUCCESS STORIES — SIPPY CUPS

- **Project Details**
  - End-user : Infant Care Products, USA
  - Part-name : Sippy Cups (ISBM)
  - Grade : Kostrate ® Edge 6535 SB
  - Opportunity : PC replacement
- **Requirements**
  - Clarity similar to PC
  - Drop impact test at 48” for 10 times
    - Filled with water & rocky ice
  - Dishwashing test, 70ºC 1.5 hours for 30 cycles
  - Must be printable and sonic weldable
- **Compliance**
  - BpA (Bisphenol A) Free
  - FDA Compliance



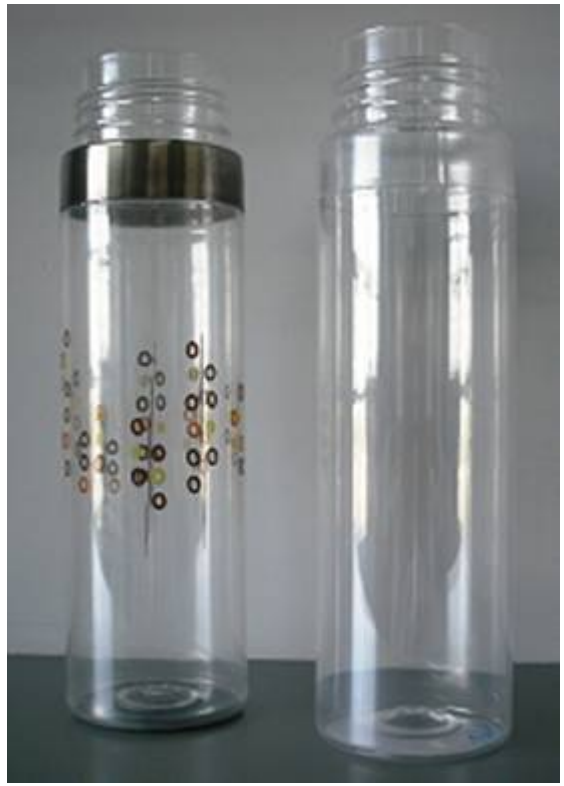
ASIA SUCCESS STORIES NURSER HOLDERS

- **Project Details**
  - End-user : Infant Care Products, USA
  - Part-name : Nurser Holders (ISBM)
  - Grade : Kostrate ® Edge 7525 SB
  - Opportunity : PC replacement
- **Requirements**
  - Clarity similar to PC
  - Drop impact test at 42” for 10 times
  - Dishwashing test, 70ºC 1.5 hours for 30 cycles
  - Must be printable and sonic weldable
- **Compliance**
  - BpA (Bisphenol A) Free
  - FDA Compliance



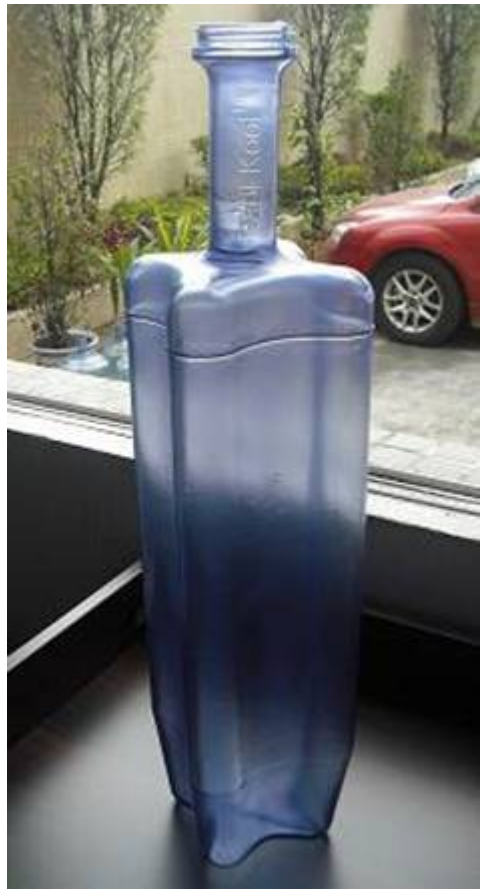
ASIA SUCCESS STORIES SPORTS BOTTLES

- **Project Details**
  - Part-name : Sports Bottles (ISBM)
  - Grade : Kostrate ® Edge PBB 307001
  - Opportunity : PC replacement
- **Requirements**
  - Clarity similar to PC
  - Drop impact test at 48” for 10 times
  - Dishwashing test, 65ºC 1.5 hours for 30 cycles
  - Must be printable
- **Compliance**
  - BpA (Bisphenol A) Free
  - FDA Compliance



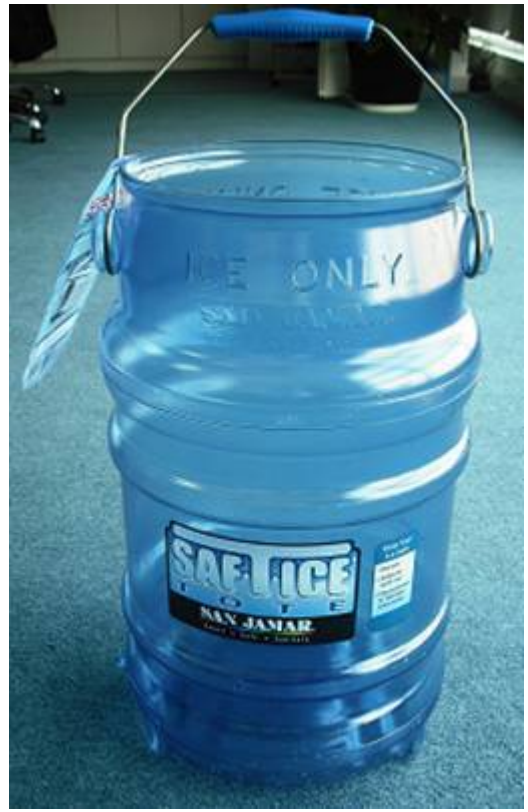
ASIA SUCCESS STORIES SOUP PADDLES

- **Project Details**
  - End-user : Kitchenware Producer, USA
  - Part-name : Soup Paddles (EBM)
  - Grade : Kostrate ® Edge Mastertough & HRM
  - Opportunity : PC replacement
- **Requirements**
  - Clarity similar to PC
  - Drop & abuse test
    - Refrigerated for several days & then fill with ice
    - Drop the unit from 5ft height
    - Abrasion & scratch test
  - Clean-ability/ Dishwashing
  - Chemical Resistance- various cleansers and sanitizers
- **Compliance**
  - BpA (Bisphenol A) Free & FDA Compliance



ASIA SUCCESS STORIES — ICE BUCKET

- **Project Details**
  - End-user : Kitchenware Producer, USA
  - Part-name : Soup Paddles (EBM)
  - Grade : Kostrate ® Edge Mastertough & HRM
  - Opportunity : PC replacement
- **Requirements**
  - Clarity similar to PC
  - Drop & abuse test
    - Refrigerated for several days & then fill with ice
    - Drop the unit from 5ft height
    - Abrasion & scratch test
  - Clean-ability/ Dishwashing
  - Chemical Resistance- various cleansers and sanitizers
- **Compliance**
  - BpA (Bisphenol A) Free & FDA Compliance



Kostrate ® Edge~
Clearly A Safer Solutions!

Thank You!

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PolyOne
Sustainable
Solutions