

# GREENTECH 2002

## 25 April 2002 The Netherlands

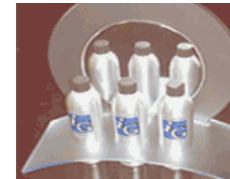
### *Isosorbide - A New Bio-Based Monomer Enhances the Value of Polymers*



*Starts  
Here!*



*Ends  
Here!*



ROQUETTE : C. RUPP-DAHLEM



DuPont : D. J. MAGYAR



# ROQUETTE HISTORY

## ROQUETTE FOUNDATION

- 1933** Company creation and potato starch plant start-up at Lestrem (France)
- 1946** Corn starch plant start-up at Lestrem (France)
- 1951** Establishment of a Research and Development Centre at LESTREM (France)
- 1954** SORBITOL plant on stream at LESTREM (France)

## ROQUETTE EXPANSION IN EUROPE

- 1956-2000** Constructions and acquisitions of starch derivatives plants in France (Vecquemont, Beinheim, Vic-Sur-Aisne) in Spain (Benifayo) in Italy (Cassano) in Romania (Calafat) and in the UK (Corby)

## ROQUETTE EXPANSION OUTSIDE EUROPE

- 1982** Sorbitol plant start-up in the USA (Gurnee/Illinois)
- 1991** Acquisition of a corn starch plant in the USA (Keokuk/Iowa)
- 2001** Acquisition of a sorbitol plant in China (Lianyungang) and in South Korea (Ulsan)
- 2002** Starting of the construction of a new sorbitol unit in China at Lianyungang (Jiangsu). This new unit will be constructed in a site of 60 ha. Initially, the capacity will be 150 000 tons of polyols (production scheduled to start in 2004)

## EXAMPLES OF ROQUETTE PARTNERSHIPS

- 1962 - 1983** Joint partnership with the American company NATIONAL STARCH for the manufacture and marketing of modified starches in Europe.
- 1998 .....** Collaboration with Ciba Specialty Chemicals for sorbitol based clarifying agents
- 1999 .....** Collaboration with DuPont for the development of PEIT (modified Isosorbide PET)



# ROQUETTE

## Sales and Figures

### TURN OVER

2 billions € in 2001

### STAFF



5000

### AGRICULTURAL RAW MATERIALS



**Maize:**  
3,100,000 tons

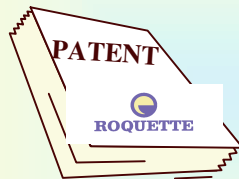


**Wheat:**  
1,400,000 tons



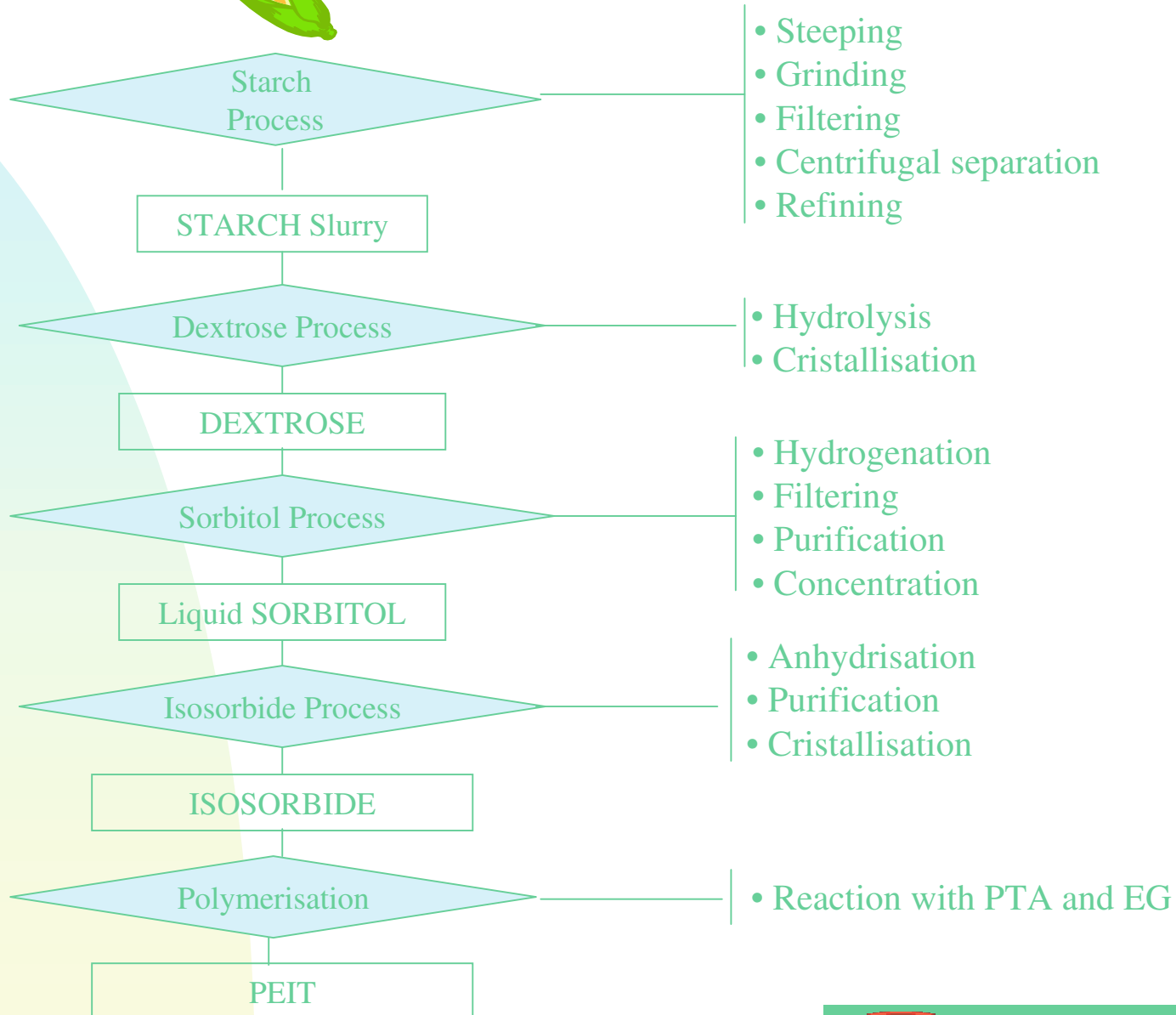
**Starch  
Potatoes:**  
1,000,000 tons

### RESEARCH



300 Researchers and Technicians

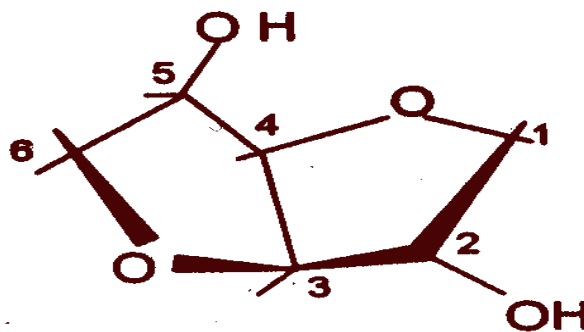
# From CORN to PEIT





# ROQUETTE "Isosorbide"

## « Molecular Structure »



## « Characteristics »

Melting point	61-64°C
Boiling point	160°C (10 mmHg)
Soluble in	Water, alcohols, dioxanne
Almost insoluble in	Hydrocarbons, esters, ethers
Very heat stable	

# ISOSORBIDE APPLICATIONS

==> Isosorbide is a chemical intermediate for production of :

- ✉ Dinitrate isosorbide for pharmaceutical applications (vasodilators)
- ✉ Dimethylisosorbide as an environment friendly solvent
- ✉ Isosorbide fatty esters as a non-ionic surfactant

==> Isosorbide is a comonomer for new « high Tg » polymers

***DuPont is a Science Company.....***

***We bring science to the marketplace in ways that benefit people and generate value for our shareholders.***



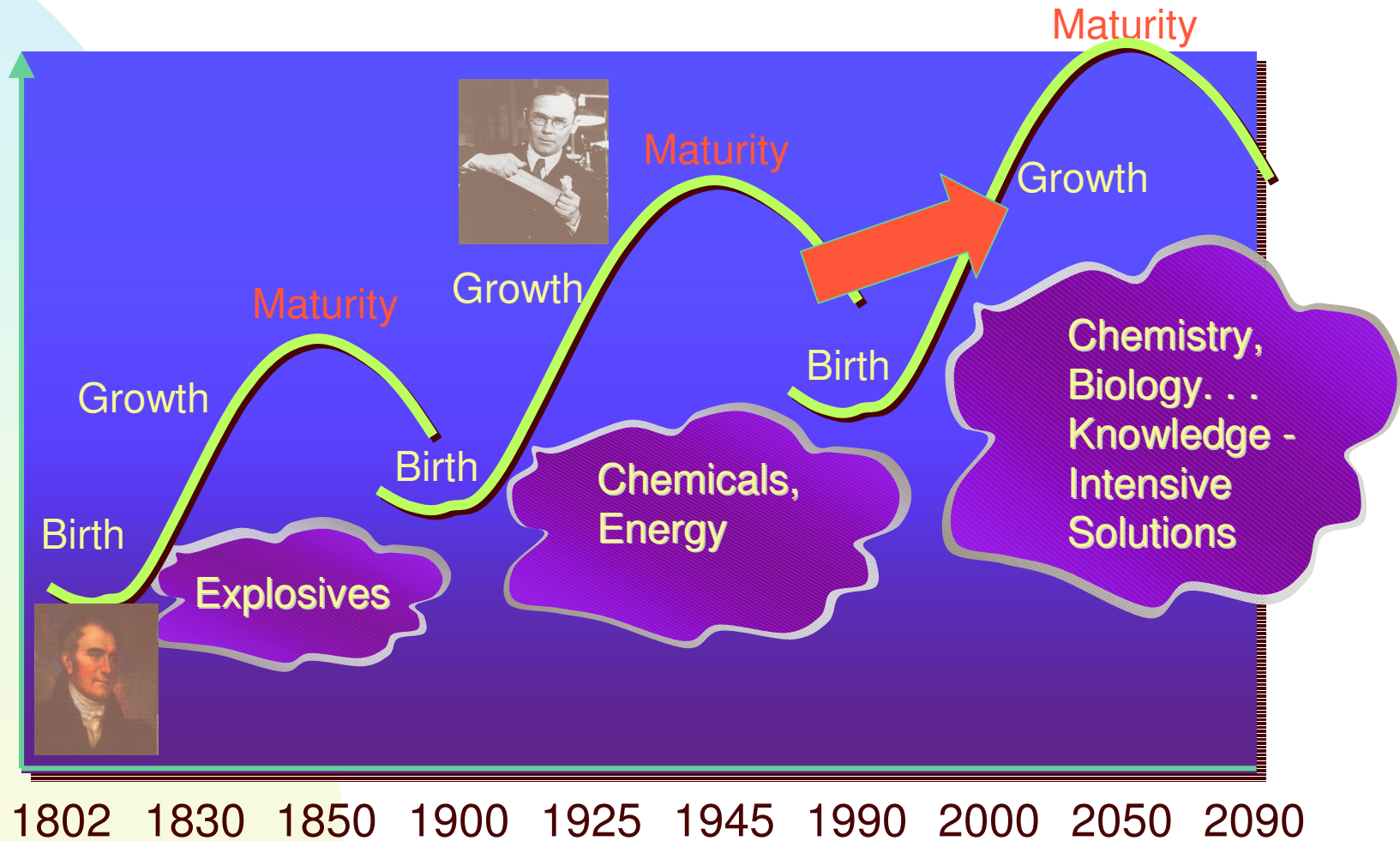
E I du Pont de Nemours  
1772-1834

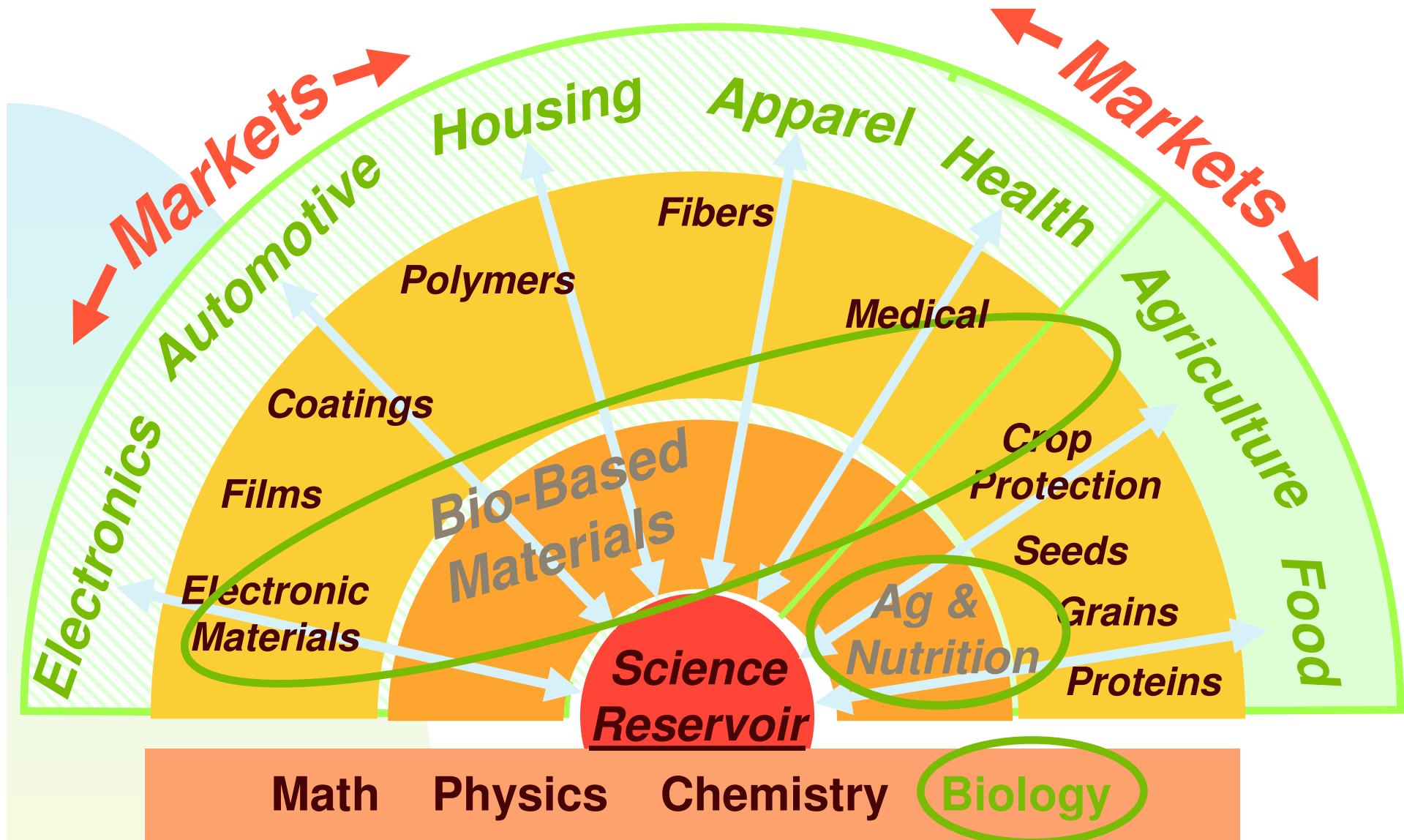


- ☛ **Founded in 1802**
- ☛ **Oldest Company listed on NY Stock Exchange and Oldest Company of the "Fortune 500"**
- ☛ **\$26.7 billion US in 2001**
- ☛ **Rated 1st...  
Financial Times/PriceWaterhouseCoopers  
2001 Survey of World's Most Respected  
Energy/Chemicals Companies**
- ☛ **World's Safest Chemical Company**



# DuPont has taken dynamic transformational steps to ensure the growth of DuPont in the 21<sup>st</sup> Century

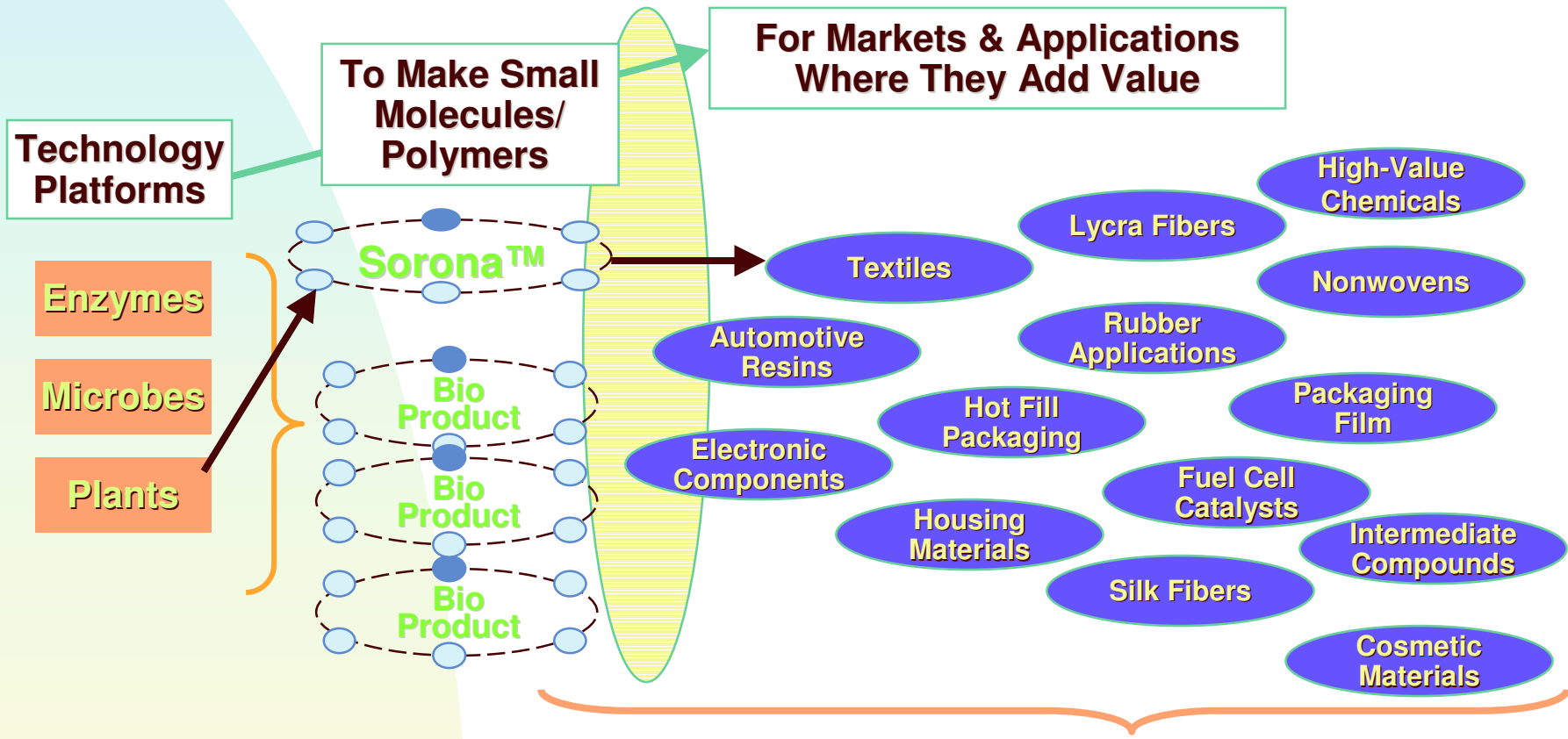




## Biology - A Powerful 4th Science . . .

# POSITIONED AT THE INTERFACE OF TECHNOLOGY & MARKETS

## DuPont's Bio-Based Materials



## DuPont Businesses + External Partners





Fiber of the Future  
.....from Corn

## **DuPont Sorona™ Polymer**



Greentech 2002 - April 2002 - Isosorbide



# Isosorbide Technology Integration & Development Partnership

Technology | Bio-Monomer Production | Polymer Production | Commercial Application



**Strong Intellectual Property Across the Value Chain** →

&



Corn → Glucose → Sorbitol ↓

Isosorbide  
monomer  
production

MONOMER

Isosorbide  
polymer  
production

“PEIT”  
Polymer

Converters  
“Make Articles”

End-Use  
Markets

e.g.,  
PET Containers  
Thermoplastics  
Fiber

The Value Proposition...

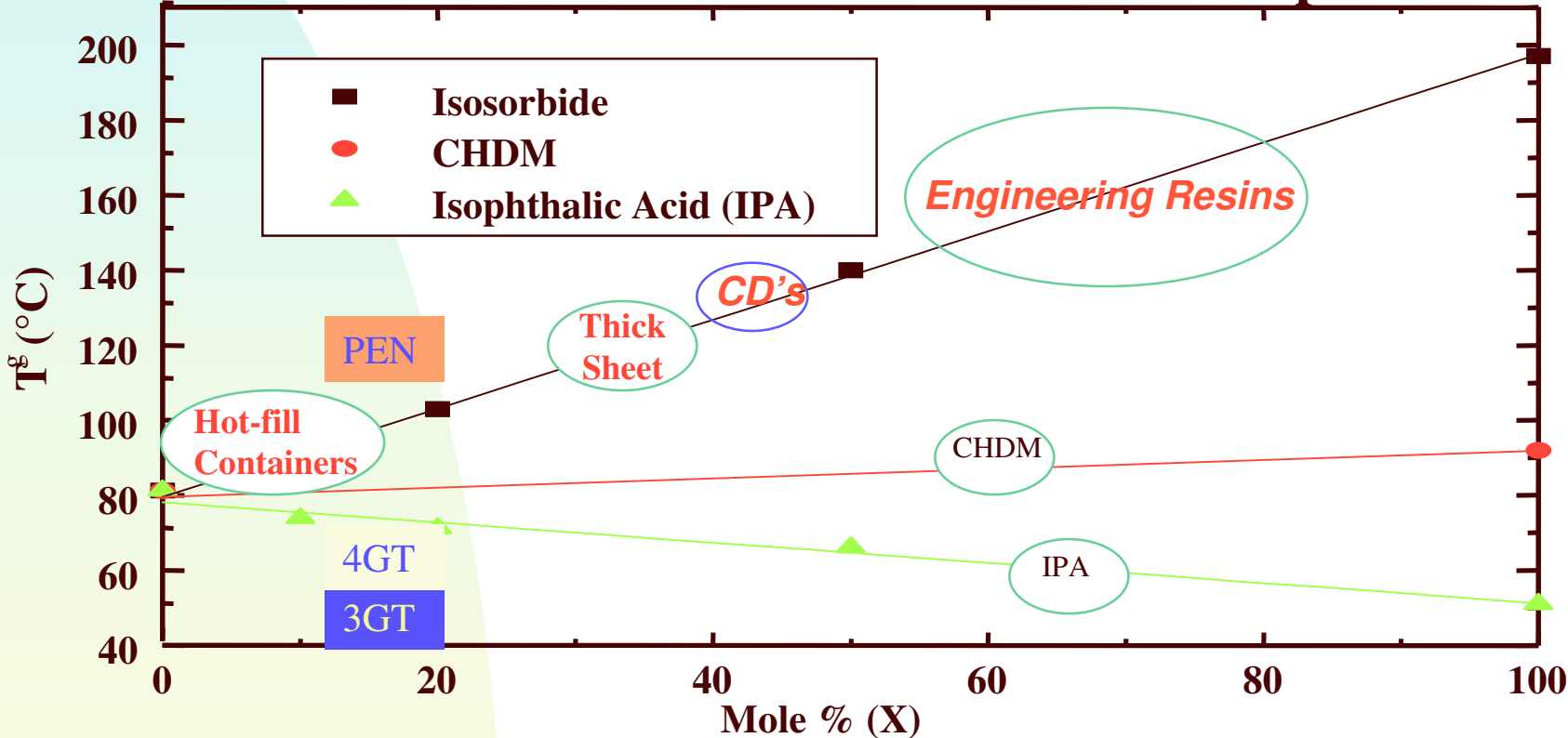
Enhanced application-functionality from higher temperature performance for use in multiple markets



# Isosorbide Value Creation for Multiple Markets

## Glass-Transition Temperature of PEIT

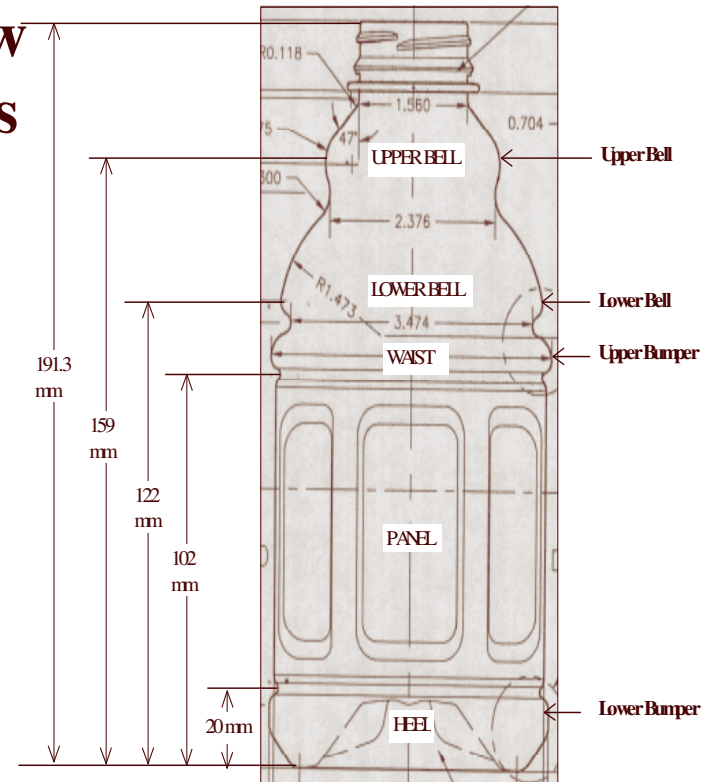
### Comonomer Effect on Glass Transition Temperature



# Isosorbide Value Creation for PET Containers

- ☛ **Higher Tg performance** creates new opportunities for PET beyond today's limitations
- ☛ **Cost savings** options include eliminating need for heat-set operation, provides faster cycle time and/or weight savings
- ☛ **Performance demonstrated by** Plastics Technologies Inc.

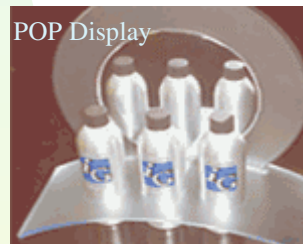
## PET Hot Fill Containers



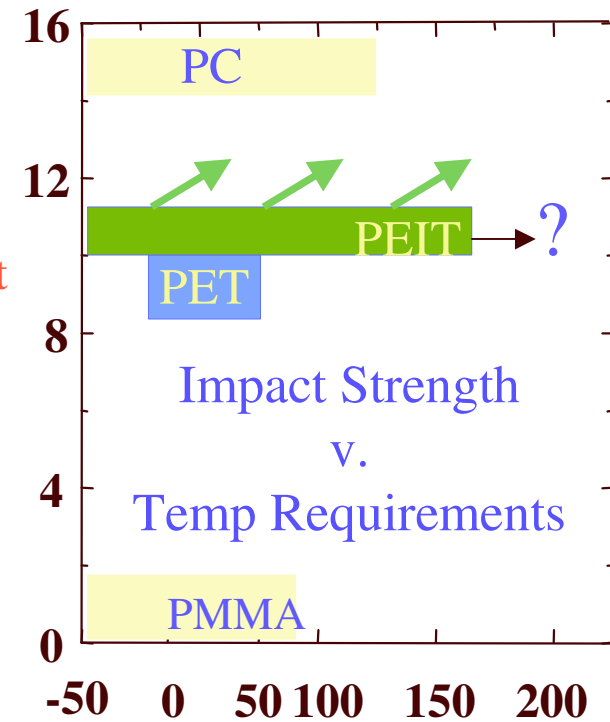


# Isosorbide Value Creation for Thermoplastics

- ☛ PEIT fills voids between Polycarbonate (PC), Acrylics, and PET
- ☛ High T<sub>g</sub> (90 - 160 °C)
- ☛ Optically Clear



Dart Impact / kN

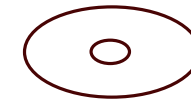
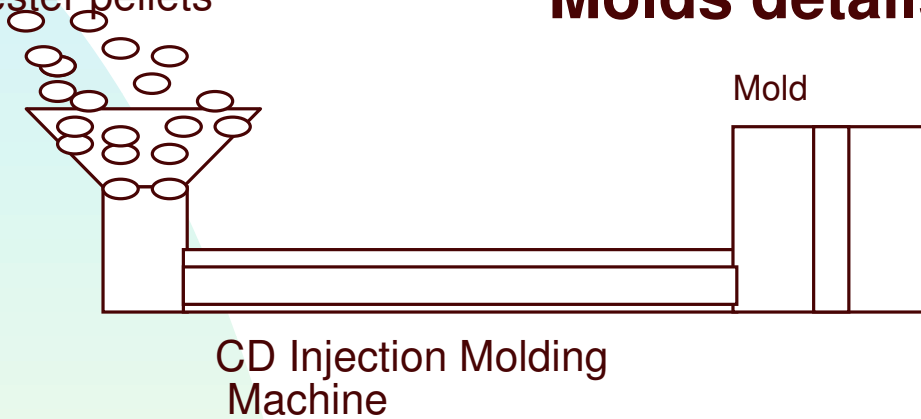


Max. Service Temp. / °C

# Isosorbide Value Creation for Thermoplastics

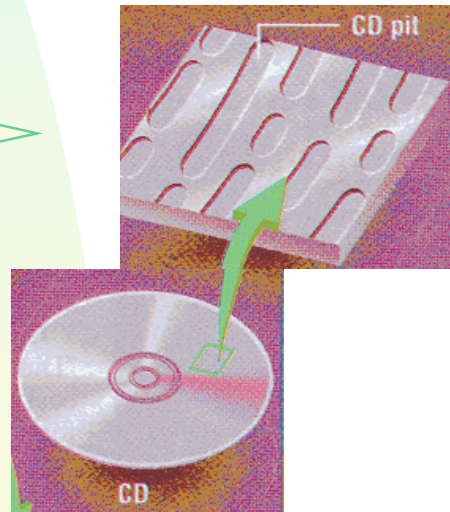
## CD's

Amorphous High Tg Polyester pellets



Molded CD

Coat and Metalize





# Thank You...



Greentech 2002 - April 2002 - Isosorbide





# Thank You...



Greentech 2002 - April 2002 - Isosorbide

