

# Then, How Toray will achieve?



Toray Nanotech Television Commercial (on the air in Japan from October 2007)

10/07/2010

**TORAY** Innovation by Chemistry

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Strategic Approach:

How we contribute for sustainability?

# One of criteria: Reduction of GHG

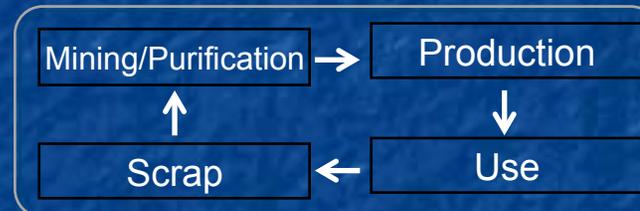
## Approach to reduction of GHG . . .

(GHG: Green House Gas)



## Reduction of CO<sub>2</sub> based on Carbon-Balance \*

\* Amount of CO<sub>2</sub> emitted over the full life cycle of a product



Contribution to reduction of GHG at Mining/Purification, Production, Use and Scrap

What we have to see:  
Globally Sustainable, Sound Material-Cycle Society  
(harmonizing environmental protection and economic growth)

# Sustainability: How Toray resolve?

Toray group's philosophy:  
Contributing to society through the creation of new value  
with Innovative ideas, Technologies, and Products



Toray seriously focuses on technology based contribution.

## Viewpoints

- ◆ Energy Saving · New Energy
- ◆ Non-fossil Raw Materials
- ◆ Water Treatment · Air Purification · Low Environmental Impact
- ◆ Recycling

# Project called as "Eco-Challenge"

|   | Fibers & Textiles  | Films & Film Products                      | Plastics & Chemicals             | Carbon Fiber Reinforced Plastics | Electronics & Information related Products | Water-related & Environment |
|---|--|--|----------------------------------|----------------------------------|--|-----------------------------|
| Energy Saving   | High Efficient Manufacturing Process   |  |                                  |                                  |  |                             |
|   | Energy Saving Molding Technology · Energy Saving Process using Membrane Technology |  |                                  |                                  |  |                             |
|   | Modernization of Private Power Generation  |  |                                  |                                  |  |                             |
|   | Materials for Energy Saving House (Heat/Insulating · Reflecting · Exchanging)      | Plastics for Automobiles                   | CFRP for Automobiles & Aircrafts | Advanced EL Materials            | Water Treatment Using Membrane Technology  |                             |
| New Energy  | Parts of Battery   |  | Parts of Wind Power Generator    |                                  |  |                             |
|   | Materials for Li-ion Battery · Fuelcell  |  |                                  |                                  |  |                             |
|   | Materials for Solar Cell   |  |                                  |                                  |  |                             |
| Non-fossil Raw Materials Bio based chemicals                  | Polymer Products from non-food crops Biomass                                       |  |                                  |                                  |  | Membrane Bio-reactor        |
|   | Cellulosic Fiber (Solvent Free)  | Chemical Process using Membrane Technology |                                  |                                  |  |                             |
| Water Treatment · Air Purification · Low Environmental Impact | Heat-resistant Bag Filter  |  |                                  | CNG · H <sub>2</sub> tank        | Waterless Plate Printing                   | Membrane Module · System    |
|   | Artificial leather Eco-process   | Molding Film (replace painting)            |                                  |                                  | Resin type BM                              |                             |
| Recycling   | Halogen-free flame retardant Materials   |  |                                  |                                  |  | Air Filter                  |
|   | PET, N6, PBT, ABS, PPS   |  | DMSO                             | CFRP                             |  |                             |

The Third Three-Year Environmental Plan

Technical innovations:

Toray's positioning in Value Chain

- Both of seeds oriented and market oriented
- Long term perspective
- Examples in Sustainable society

# Toray's positioning in supply chain

## Chemical materials value chain

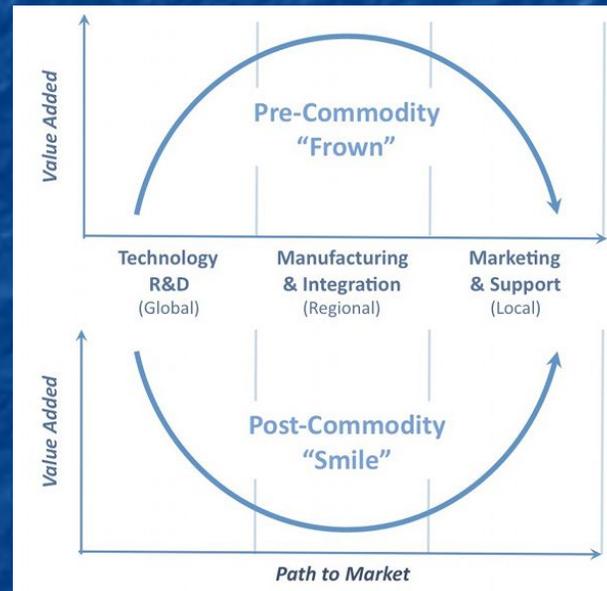


Reality: Toray is located at Intermediate-Downstream sector

# Toray's positioning in supply chain

Intermediate positioning is hard to maintain business

Material science  
Manufacturing expertise  
Capability/Scalability  
Technology oriented  
How can we discover  
“Exciting topics”?  
Long term



Economics  
Market requirements  
Tangible subjects  
Intangible subjects  
How can we keep Earth  
“Green/Clean” ?  
Short term

Acer founder Stan Shih's "Smile Curve"

“Sustainability” is difficult keyword for most of materials providers

# Toray's DNA: Both pathways

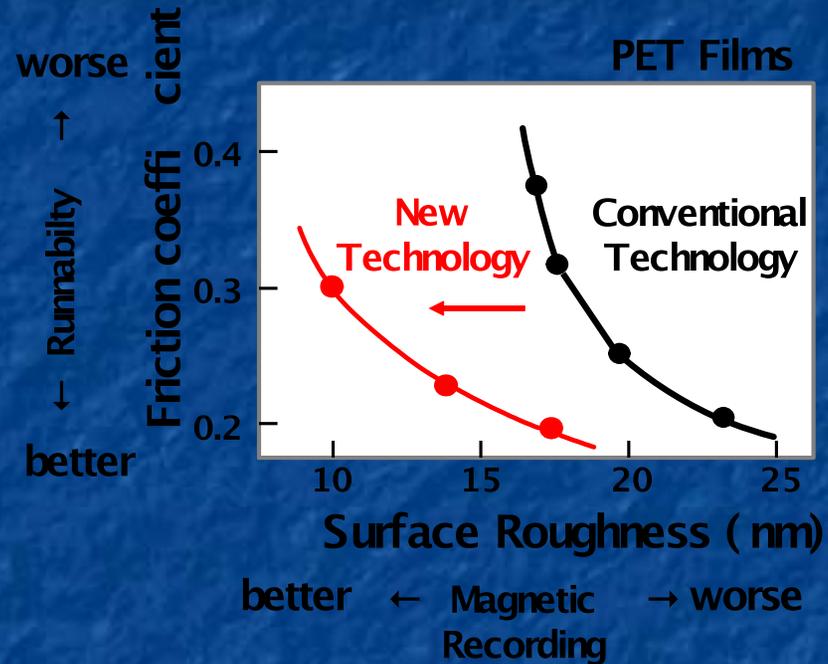
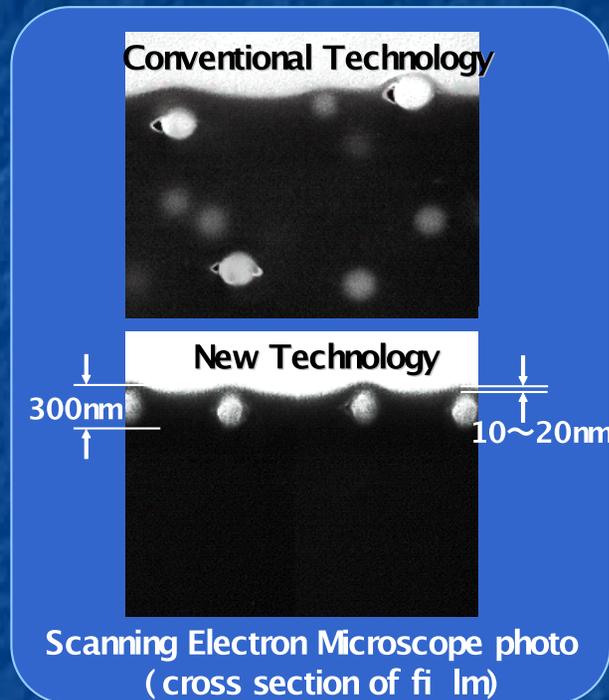
## 1. Design Oriented Nanotechnology (Needs Oriented)



## 2. Discovery Oriented Nanotechnology (Seeds oriented)



# Example of Needs oriented

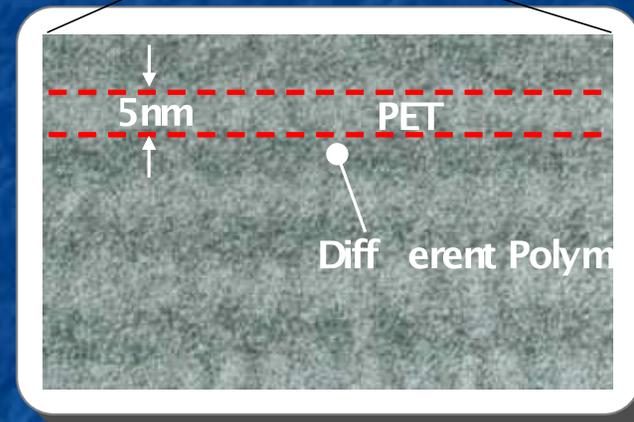
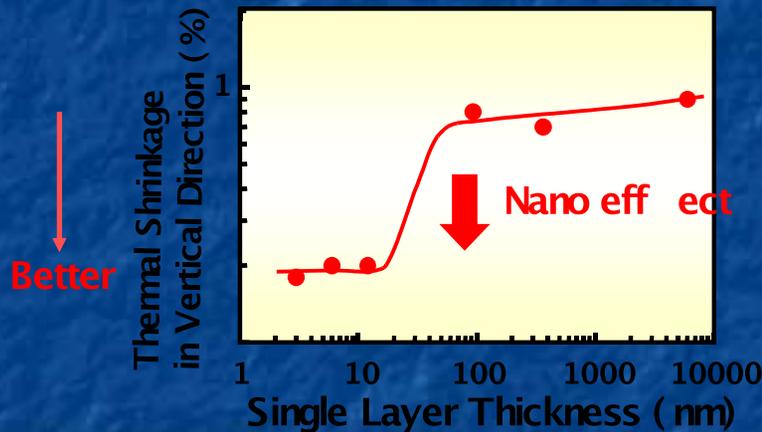


- ★ Overcome the “Dilemma” between Runnability and Magnetic recording
- ★ Control the height of surface protrusion of PET film in 10 to 20 nm
- ★ In market as Toray's standard PET films in the world since 1992

# Example of Discovery oriented(1)



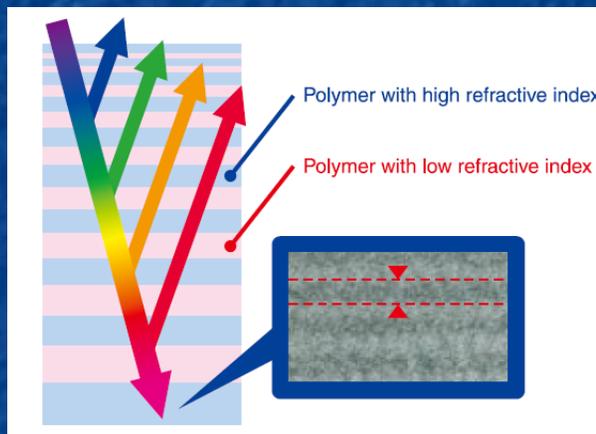
Example of Nano Effect



- ★ Discovered "Nano Effects" in some properties by pursuing thin layered films.
- ★ Created new film process to reduce thickness of one layer to 50 nm.
- ★ Developing new products in which "Nano Effects" show significant advantage.

# Example of Discovery oriented(2)

Nano scale multi layer structure makes another optical property  
- Metallic color without any metals



Nano structured film achieved new features.

1. Environmental friendly: No metal plating, no metal coating
2. High Electromagnetic wave transmission: good opportunity for wireless applications
3. Easy formability: free from cracking and blanching
4. Stability: No corrosion