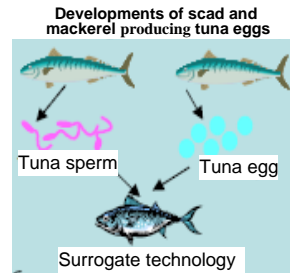


Complete Cultured Technology for Wide-Area Migratory Fish (Eel and Tuna)

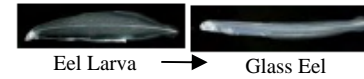
Outline of Technology

- Egg-laying control technology by hormone treatment (Eel in lay is not in adjacent seas of Japan)
- Surrogate technology in fish (Eggs of big fish can be produced in small aquariums and any egg can be produced in all season)
- Breeding technology in preventing cannibalism and crush.
- Preparation technology of food with special nutrition and vivatium matching growth of larva.



Superiority of Japanese Technology

- Japan has developed approx. eighty fry (young fish)-production technologies.
- Japanese technology level of surrogate womb for use with eggs of different fish species is top in the world.
- Japan is the only country in the world that has succeeded in producing completely cultured tuna and eel fry for cultivation.



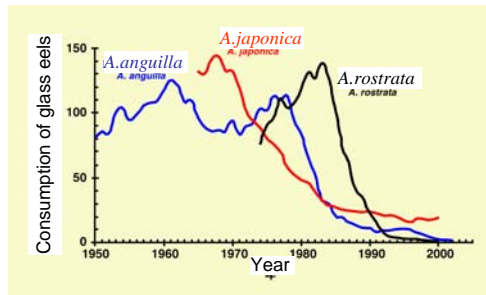
Succeeded in producing glass eels in a global first



Succeeded in Bluefin Tuna aquaculture in a global first

Impact on Society

Rapid Decrease of Fare of Glass eels



(Currently, the young glass eels are fished from open sea and grown in the farm before the cultured eels are shipped)

- European eels are controlled by the Washington Convention

Enhanced International Fishing Control of Tuna

Reduced fishing limits for Bluefin Tuna and Southern Bluefin Tuna

- East Atlantic Ocean Bluefin Tuna (Japanese fishing limit)
2830 ton (in 2006) → 2174 ton (in 2010)
- Southern Bluefin Tuna (Japanese fishing limit)
6065 ton (in 2006) → 3000 tons (in 2007)

• Establishment of complete cultured technology

• Stable supply of eels and tuna

• Secure marine resources

• Acquisition of foreign currency through exports

• Commercialization by productivity improvement and cost reduction

Crisis of marine resources in the 21th century: worldwide decline in the catch of fish and increase of global consumption of fish

Required Framework for Technology Development

- Research system for sustainable development of cultured technology
- Reinforcement of the collaborative relationship between researchers and business organizations for commercialization
- Reinforcement of the management system of research projects
- Improvement of research institution
- Reinforcement of the collaborative relationship between researchers and local municipal entities

Required Reformation in Social System

- Improvements of interoperable research ships and equipments
- Recruitment of international staffs and acceptance of foreign researchers.

Rare Metals - Alternative Materials/Recovery Technologies

Outline of Technology

- Scientific study on the role/mechanism of the component elements on material's characteristics, and the development of alternative materials that can replace scarce resources such as rare metals with more common elements.
- Development of technologies/systems for efficient recovery of scarce resources, such as rare metals in used/waste products, as recycled resources with minimal environmental impact.

Superiority of Japanese Technology

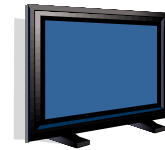
Japan leads the world in:

- Research of zinc oxide, a candidate for the technology of indium-less transparent electrode, with its basic patent applications.
- R&D of dysprosium associated with the performance (high temperature operation capability) of Nd-Fe-B system magnet.
- Development of catalysts without deactivation with multiple time usage.
- Recovery technology of rare metals by stabilizing elements requiring special management such as heavy metals as non-soluble large crystals.

Impact on Society

- Steep price rise and supply risk take place on scarce resources such as rare metals widely used in advanced industries such as electronics, ICT, automobile, robotics and medical applications due to the consumption increase with the global economic growth and with the expansion of emerging industries and due to the resources policy of the countries.
- Not only releasing from resources limitations but also promoting resource diplomacy by developing alternative materials/recovery technologies to maintain/enhance industrial competitiveness
- Possible consumption reduction of over 50% of indium, a crucial element for LCDs and with a concern on its stable supply, by means of the development of alternative materials/recovery technologies.
- Possible consumption reduction of over 30% of dysprosium, a crucial element for high performance magnets for hybrid cars etc. and with a concern on supply risk, by means of the development of alternative materials/recovery technologies.
- Management of heavy metals etc. in used/waste products.

Examples of Rare Metal Applications



LCD TVs
(indium)



Hybrid Vehicles
(dysprosium, platinum)



Mobile Phones
(cobalt, indium, rare earth)



Carbide Tools
(tungsten)

Required Framework for Technology Development

- Development of substituting technologies by promoting the industry-academia (universities, research institutes) collaborations in order to investigate the fundamental mechanisms.
- Development of recovery technologies by promoting the collaborations among universities, non-ferrous metals smelters, recycling industries and local government for the efficient recovery of rare metals from used/waste products and for the demonstration R&D of recovery efficiency and environmental impact through rare metal recovery etc. by using non-ferrous metal smelting technology.
- Promotion system based on the medium to long term strategy on the resource supply risk in Japan.

Required Reformation in Social System

- Need to develop a database of rare metals in products with recovery technologies established.

Production Technology by Utilizing Genetic Recombination Microbial (Energy/Chemical Engineering Material)

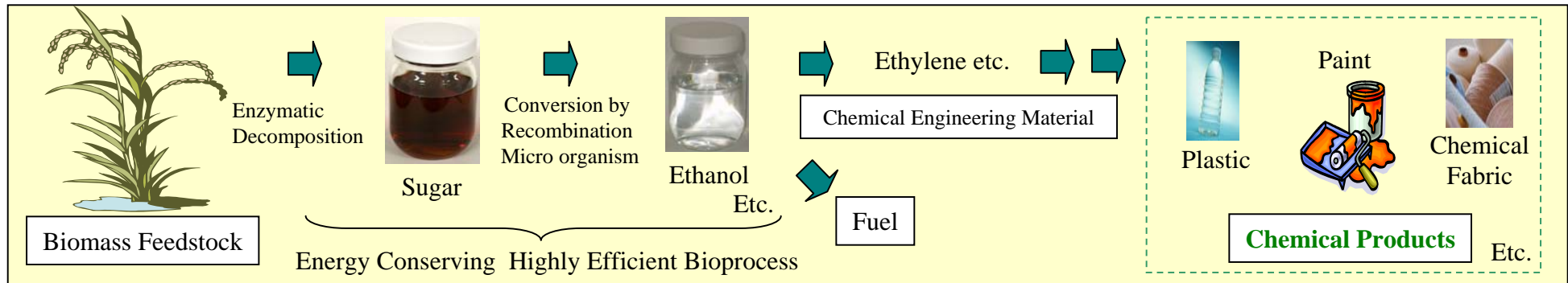
Outline of Technology

- Produce energy sources such as ethanol and butanol, and chemical products from biomass by utilizing micro-organism.
- Technology of Minimum Genome Factory (MGF), in which the novel microbe is constructed by the deleting unnecessary genes from the genome and enhancing expression of necessary genes.
- Technology to construct the novel microbe that enable mass production at high efficiency by extensive modification of the genome structure.

Superiority of Japanese Technology

- Japan has a long history and tradition of brewing, and the fermentation technology in Japan is on a high level.
- In Japan, the applied research to produce energy and chemical products by utilizing micro organisms has been studied actively. The patents and utility model patents are applied approx. 1500 per year.

Impact on Society



For example, approx. 2 million kL of ethanol could be produced from half the rice straw and hulls disposed of in Japan. That is 3 % of the 60 million kL/year of gasoline consumed in Japan and covers all the amount of E3 gasoline. Or it could be used as a substitute for ¼ of ethylene produced, approx. 7.5 million t/year, for chemical engineering materials.

Required Framework for Technology Development

- System development related to collection and storage of biomass material.
- Infrastructure development for utilizing biomass fuel.
- Stable biomass resource securing system with consideration given to overseas deployment.

Required Reformation in Social System

- Development of biomass fuel supply system.
- Investigation of support system to promote use of biomass fuel.

New Catalyst Chemical Manufacturing Process Technology (Underwater Function Catalyst)

Outline of Technology

- Realization of innovative chemical processes with drastic reduction of energy and resources use, and wastes production through novel catalysts.
- Green Sustainable Chemistry technology.

Superiority of Japanese Technology

- World's first catalyst to operate in water; Japan's original.
- Published in top level academic journals such as 'Science' magazine and 'Journal of the American Chemical Society.'
- World's top 10 citations in the chemistry field.
- Basic patent (substance patent) already applied for.

Impact on Society

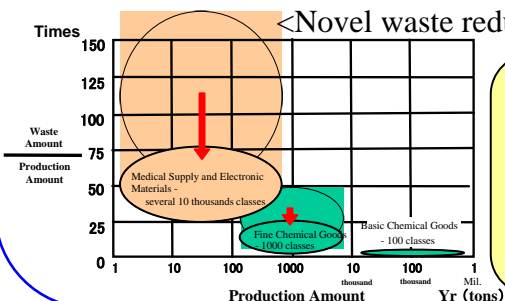
○(Ex.) Catalyst technology that drastically reduces the use of organic solvent

Existing Process

- Use of large amount of organic solvents as solvating media

New Catalyst Process

- Novel process to enable the synthesis in water that used to need organic solvents → Solvent free processes
- Can be applied to chemical treatment of waste water, fine chemicals and medical applications, etc.



○ Eliminates 25 % of the waste of the entire chemical industry (Approx. 4 million tons)

○ Improved Productivity

Resource Productivity... 3 times

Time Productivity... 10 times

Land Productivity... 10 times

Energy Productivity... 5 times

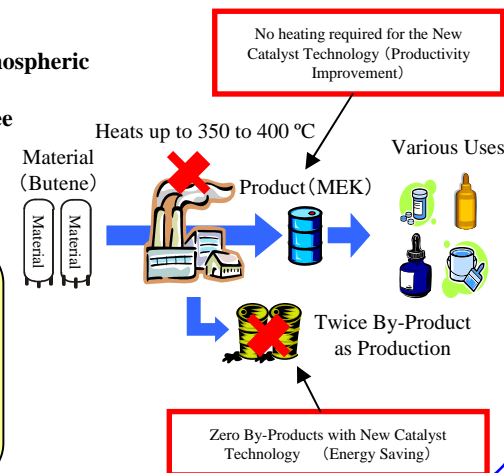
○(Ex.) Production technology that eliminates by-products (MEK Production) *MEK: Methyl ethyl ketone (Domestic production: 270 Kt.)

Existing Process

- Heating needed (350 to 400 °C)
- Nearly doubled amount of by-product (ammonium sulfate) to the product (Approx. 0.5 Mt)

New Catalyst Process

- Enables room temperature and atmospheric pressure production
- By-product (ammonium sulfate) free



Required Framework for Technology Development

- Development of basic technologies under a collaboration of universities, research institutes and private companies.
- Fundamental development for demonstration plant, user evaluations and commercial plant operation.

Required Reformation in Social System

- None

Outline of Technology

Japanese research team discovered a new superconducting material in early 2008. The material, unexpectedly realized by incorporating a magnetic element, is expected to have excellent characteristics due to unpredicted mechanisms. It also has a high degree of freedom in material design because it allows changing materials composition with various elements. Due to the rapid catch-up by other countries, however, an urgent measure is necessary.

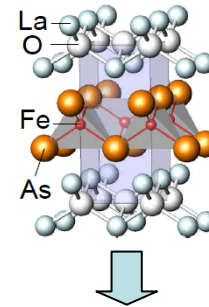
Superiority of Japanese Technology

- Oxide (Bi-system) and metallic system (MgB_2) superconductors have been discovered in Japan.
- Research organizations with high research potential on superconductivity from the basics to the development, such as industry, universities, research institutes etc.
- High quality and large number of researchers and engineers.
- Japan is the only country with advanced manufacturing technology such as superconducting wires and coils for commercialization.

Impact on Society

New superconducting materials with high magnetic field tolerance have been explored because the state of zero electric resistance cannot be sustained under high magnetic fields. A recently discovered new superconducting material, unexpectedly realized by incorporating a magnetic element, has significantly high magnetic field tolerance. For example, it will enable compact, low cost electric magnets and accelerate commercialization in medical MRI, storage systems, superconducting vessels, magnetic levitation etc.

New Superconducting Material



Medical MRI

Development of compact superconducting electric magnets generating high magnetic field at low cost
→ cost reduction and high precision of inspections



Ultra-high speed transportation system.

Improved energy efficiency by using compact electromagnetic motors

- Development of superconductors with high magnetic field tolerance
- Search for high transition temperature material

Required Framework for Technology Development

- Development of research center network for researchers with different research backgrounds.
- Seamless research support system considering research phase (JST-NEDO collaboration.)
- Participation of research institutes, industries etc. with materials R&D technology and/or facilities from early stages.

Required Reformation in Social System

- Support system with intellectual property strategy of specialists to acquire comprehensive patents.
- Long term support system for dedicated researchers.
- Double-check of the properties of new materials by neutral institutions.