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Abstract Title:

Green Chemistry: Keyword for the cooperation of developed and developing countries and for the public understanding of chemistry

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Referring to the enclosed WCLM 2001 Selected Findings, what specific point is addressed by this report (point number): 10 and 11

Abstract

Green Chemistry (GC) is an important concept that guides chemists (here, chemical engineers are included) to the “way forward” to sustainable society and a keyword for the fruitful cooperation of developed and developing countries and for the public understanding of chemistry.

GC is required by two reasons; the limit of massive growth and the increasing risks of chemical substances.

As Environmental Impact (EI) = (EI/GDP) x (GDP/Population) x (Population) and the last two terms increases in most countries, we must devote much efforts to reduce the magnitude of (EI/GDP). Most necessary is to reduce it in developing countries, so that they will not follow the Kuznets’ curve but make a shortcut to the down slope of the curve. Transfer of GC technology and GC education is very appropriate for this purpose.

The Chemical Society of Japan (CSJ) is promoting various activities in relation to GC and environment issues. One of them is the First International Symposium of Green and Sustainable Chemistry (GSC) which was held in Tokyo last March with the Tokyo Statement on GSC. These were acknowledged in the statement of our Emperor on the occasion of the 125th anniversary of CSJ.



Cooperation in Green Chemistry

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Green Chemistry (GC):

- *Environmentally friendly chemical processes and products.**
- *Precaution rather than Diagnosis and Treatment**
- *Design for Benign to the Environment**

Two meanings (narrow and broad):

- (1) Creative chemistry for the sustainable society**
- (2) Movements in chemical community for GC**

GC was one of the key issues in the 1st WCLM in 2001.

Why is Green Chemistry (GC) necessary?

Limit of growth in quantity

Risk of chemical substances (qualitative)

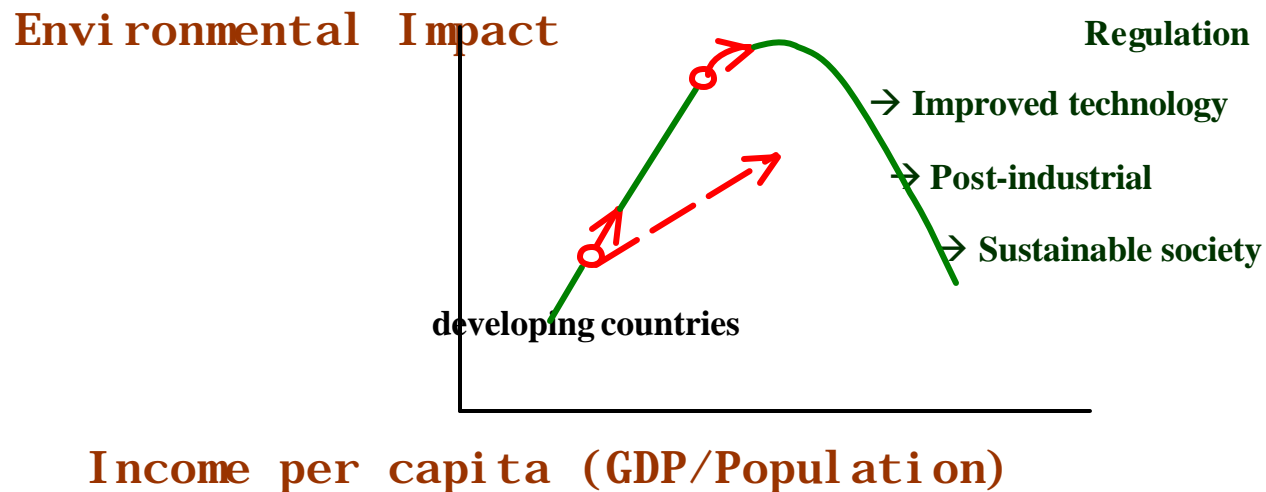
The Objectives of GC:

- 1. Substantial suppression of environmental impacts of chemical processes and products**
- 2. Improved performance with minimal environmental impact**
- 3. Good relationship between chemistry and general public.**

“GC is a keyword for the cooperation between developing and developed countries, and between chemists (chemical engineers) and general public.”

$$\text{Environmental impact (EI)} = \frac{\text{EI}}{\text{GDP}} \times \frac{\text{GDP}}{\text{Population}}$$

Environmental Kuznets Curve (EKC)



→ *Technology transfer, etc. to developing countries supported by developed countries are indispensable for the sustainability.* → **Cooperation**

Public image on chemicals and chemical technology

Chemicals: Survey of CSJ (2001) with the government indicates that

- * Citizens know the *necessity of chemicals*, but feel *insecurity with chemicals*, particularly with the effects to the next generation.
- * Only 17% of citizens know that the adverse effect very much depends on the exposure to chemicals. Quantitative thinking lacks.
- * Information about the safety of chemicals is mostly from newspapers and TV.

Chemical Industry: Survey carried out by JCIA in 2002 shows that general public appreciates the *benefits of chemical products* and efforts of chemical industry made for the environment and safety, but ranks the chemical industry *least favorable* among five industries (car, medicine, information, electric, and chemical).

This is very similar to a CEFIC survey in 2002 (*7th among eight*).

Green Chemistry stresses the efforts of the chemical community to establish a good relationship between chemists and general public.

Disclosure of information

Transparency

Risk communication

Provision of neutral scientific data and criteria

Education of not only students majoring chemistry and chemical engineering but also students of other majors is essential. The latter students become school teachers, journalists, housewives, etc.

→ **For the general public to make sound judgment based on common rational knowledge**

Importance of quantitative comparison (risk assessment, risk vs. risk, and risk vs. benefit comparison) and minimum basic knowledge



Activities of the Chemical Society of Japan

Affiliated to IUPAC via SCJ (Prof. Ohtaki)

Committee for Environment and Safety

Continuing efforts for the promotion of activities for the environment and safety

Environment Charter 1999 of CSJ

Green Chemistry Forum

Textbooks, Seminars, Symposia

Surveys with collaboration with governments

Collaboration with other academic societies and industries

Green and Sustainable Chemistry Network (GSCN)

10 organizations including CSJ as a key player

1st International Symposium on GSC, Tokyo, March 2003

760 participants from 21 countries, including from industries, government, and academia

→ *“Tokyo Statement of GSC”*

GSC Awards from three Ministers



Concluding Remarks

Green (Sustainable) Chemistry is a good keyword

for the promotion of chemistry and chemical technology,

for the cooperation of developing and developed countries, and

for the establishment of good relationships between chemistry and society including the environment.