– Vision –

Electrochemistry and Conservation of the Global Environment

Yoshio HORI

Emission of carbon dioxide by combustion of fossil fuel exceeds 5 billion ton per year as elemental carbon. Approximately 50% of carbon dioxide emitted by mankind has been accumulated in the atmospheric air since the industrial revolution. The concentration of the atmospheric carbon dioxide is increasing by 1.4 ppm annually on the average, and the greenhouse effect due to carbon dioxide is threatening mankind with global warming or irreversible and rapid climatic change.

To what degree must we reduce the amount of carbon dioxide emitted to the atmosphere to prevent or at least retard the probable destructive climatic change? Let us suppose we can solve the problem by fixation of carbon dioxide. As a rough estimate, we shall have to fix at least 10 to 20% of carbon dioxide evolved from fossil fuels, i.e. 0.5 to 1 billion ton per year as elemental carbon. How can we fix such a mass of carbon dioxide? It may be converted, for example, to some structural materials for buildings and so on by chemical processes. For comparison, the present polymer industries supply their products of 0.08 billion ton every year in the world. The production of cement industry is approximately 1 billion ton per year. Now we understand what a huge amount of carbon dioxide we have to treat. We shall probably have to create a new chemical industry.

Practical long term solutions to this problem will probably contain the followings; (1) utilization of non-fossil fuels or solar energy above all to meet a part of the energy demand, (2) development of low energy consuming society with high living standard supported by efficient energy utilization techniques, and in addition to them, (3) establishment of recycle system of carbonaceous materials in which a great amount of carbon dioxide is fixed and converted to some useful substances. These solutions will be realized by progresses in conversion technologies between energy and chemical substances.

Electrochemistry has so far created many useful industrial techniques, not only for production technologies but also for prevention of local environmental pollution such as waste water treatment and electro-analytical measurements, since its birth in last century. Mankind is being faced with an enormous difficulty which has never been experienced in the past historic age. Now is the time that electrochemistry makes further important contributions to conservation of global environment toward the coming new century.

Head of the Editorial Board on the special issue "Electrochemistry and Environmental Chemistry", Professor, Department of Applied Chemistry, Faculty of Engineering, Chiba University (Yayoi-cho, Chiba 260)