Chapter 1
Introduction of Environmental Materials

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ABSTRACT

Advances in environmental materials are described especially concerning about utilization of natural source and their waste, for example biomass and their re-uses. They strongly support development to sustainable society. So, these classify and demonstrate environmental technologies, which strongly contribute to overcome pollution environment for the purpose of sustainable society. In view point of green chemistry and the related technologies to representative biomasses and inorganic wastes are applying for advanced functional materials. Since biomass and inorganic wastes are very interesting candidates for regenerated materials, it is very meaningful to understand and attention to environmentally and friendly materials and technologies. This is because that an increasing environmental concerns to sustainability.

INTRODUCTION

Chemistry brings comfort in modern life. For example, clothing is made with a synthetic fiber, and dye of various clothing is a product of the chemical industry. Computers have each outside of home electric appliances made with plastic and metal. These are mostly made from oil and a mineral through many chemical steps. So, chemistry greatly contributes to securing of richness of the human and supports to construct the high civilization. On the other hand, pollution of air, water and soil increases as industry becomes active. The pollution has influenced human health and been injured. However, many developed countries including Japan have overcome the pollution now, and the global environment has been improved by green technologies. However, the problem of the global environment was gradually actualized. Resources and the acceleration of the energy consumption lead to anxiety of earth resources. Furthermore, the consumption of a large quantity of fossil fuel causes the sharp increases of carbon dioxide and soot particles such as particle pollution (PM2.5) in atmosphere (Liu, Hsu, Lee, Ye, Zheng, Liu, Li, & Cui, 2015). When the growth of the human reaches the limit by the resources drying up and environmental aggravation, the report “The limit grow” of 1972, in particular, Club of Rome, sounds an alarm bell

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(Meadows, Meadows, Randers, & Behrens,1972). Therefore, this has reviewed the development of the economy that the earth is infinite. This also comments that to keep world balance is important. In addition, the toxic substance has an influence on the people and gives uneasiness in the society. For sustainable development, the planethood has various actions and global environment improvement has been directed to deeply consider it, for example, by United Nations Environment Programme (UNEP) (UNEP, 2014) In late 2014 world climate change was already affecting many contents in global warming. This gives strong impact to food security and therefore, emphasizes the chemistry and the related technology with the global community. It is desirable to develop the consideration for environment conservation, since green chemistry can solve problems in energy, a material, an environmental pollution to pull sustained society. In other words, because the green chemistry strongly relates to eco-friendly manufacturing, the harmony with environment and the process adapted to technical development leads to development of clean technology (Williams, 2001; Andrews, Brecombe, Jikel, & Brianreid, 2004). Recently, therefore, attention has been increasingly devoted to bio-based environmentally and friendly materials because of increasing environmental concerns related to sustainability.

BACKGROUND

As already mentioned, people should recognize a limit of the growth of the global environment. The coexistence of global environmental conservation and the industrial activation becomes extremely important. This is because that, as one of example, the danger signals such as the frequent abnormal weather strongly suggest an importance in sustainable society. From such a background, the practice of the concept called “green” becomes required in a chemical technique and materials development for the sustainable society. In the minimum waste and the recycling, people should bring highly efficient environmental symbiosis in energy technology, reuse of the biomass waste and the switch to a re-used material and to the remediation technology, which is applied to the earth pollution for the conservation of our environment. Therefore, the substantial use is urgent in this century. In this chapter, an action to the sustainable society and green chemistry is introduced in the points of view of the green technology using about biomass and waste re-utilization for environment materials.

Green Chemistry for Sustainably Renewable Sources

Sustainable means operating with a long-term mindset that includes responsibly maximizing our use of renewable resources. So one of the goal of sustainability is for renewable resource management (Rosenberg, Fogarty, Sissenwine, Beddington, & Shepherd, 1993). To provide both positive examples of sustainable resource use and lessons for future improvements in materials, a renewable resource is mainly an organic natural resource and can replenish to overcome usage and consumption. In such a background, United States Environmental Protection Agency (EPA) proposed green chemistry in 1994. In green chemistry, people design chemical products and processes for reduction or elimination of the use or generation of hazardous substances. Now, green chemistry strongly relates with the product life cycle by approaching its design, manufacture, use, and ultimate disposal. So it is also known as sustainable chemistry. The rapid development of new chemical technologies and the vast number of new chemical products in the last decades turned the attention of environmentalists to remedial actions for the negative impacts. Two decades after the implementation of EPA, the Pollution Prevention Act (1990) was created