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STUDIES OF ENVIRONMENTAL CHEMISTRY - A REVIEW

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ABSTRACT

Environmental Chemistry is now a fully developed viable and exciting branch of science. It is the application of chemical principles to the maintenance and enhancement of environmental quality, the biggest challenge facing mankind today. Scientist, professional and individuals, need to have some knowledge of environmental chemistry if they want to make a meaningful contribution to the improvement of environment. For this chemistry has a special role to play as it helps in understanding the environmental changes logically and scientifically.

Scientific interest in the formation of photochemical oxidants, acid rain, and fogs and the persistence and fates of toxic chemicals is manifest in industry as well as the common man throughout the world. These environmental processes are closely interrelated and involves complex chemical reactions and physical changes. These drive the chemistry not only of these anthropogenic systems but also of

biogenic and geogenic emissions in nature. Thus, study of these diverse but interrelated reactions need some knowledge of "ecology, biology, anthropology, geology, physics etc. along with chemistry.

KEYWORDS- Environmental Chemistry, ecology, biology, anthropology.

INTRODUCTION

To understand environmental chemistry it is important to know what is environmental science? What is the meaning of environment?

Environment Science in its broader sense is the science of complex interactions that occur among the atmospheric, aquatic, biotic, terrestrial and anthropological environments. Scientifically, environmental science may be defined as the study of earth of technology upon them. Environmental science has in fact evolved from ecology, which is the study of environmental factors that affect organisms and how organisms interact with these factors and with each other?

The term environment refer to a definable place where an organism lives, including both the physical and biologic features of the place. The word environment comes from the French verb environner which means to surround, surroundings or something that surrounds. It include all conditions and circumstances which influences surroundings and affecting the organism. Environment means to all those which are physical and chemical (organic and inorganic) of the atmosphere, lithosphere and hydrosphere. It is the aggregate of external conditions that influence the life of an individual or pollution, specifically the life of human being. It ultimately determines the quality and survival of life. Organisms and environment are in constant change. Some changes are very rapid other are slow and may take thousands of years. The inter-relation between the physical environment (soil, water, air) and organism environment (plant and animal life)



constitute the study of ecology.

The term micro-environment designate a functional environment, i.e., specific environment of specific organisms. In simple words, this term refers to a small environment and therefore it is used for the immediate environment of an organism.

ENVIRONMENTAL CHEMISTRY

Environmental Chemistry may be defined as the study of chemical phenomenon in the environment.

It is a multi-disciplinary science which includes many vastly different fields such as chemistry, physics, life sciences, public health, engineering, agriculture etc. Only in recent years many chemists have become deeply involved with investigations of environmental pollution. It is important for all chemists to know environmental chemistry so that no or least damage is done to the environment through chemical and related industries. Environmental chemistry helps in identifying and determination of specific pollutant present in environment.

The branch of environmental chemistry which concern with life itself can be referred as environmental biochemistry. In other words, it deals with the effects of environmental chemicals species on life. Another closely related branch is toxicological chemistry. It is the chemistry of toxic substances interaction with living organisms. Ecology and Environment

Ecology and ecosystems considers the life habitat of over two million different kinds of animals and plants and it takes into account all manner of influences and interactions among them.

An ecosystem is any spatial or organizational unit which includes living organisms and non-living substances interacting to produce an exchange of materials between the living and non-living parts. It includes populations, communities, habitats and environments, and inter-relate the dynamic interaction of all parts of the environment focusing specially on the exchange of materials between living and non-living parts.

The environment in which a particular organism lives is called its habitat. The role of an organism is called its niche. For the study of ecology one can divide environment into four categories (i) terrestrial environment, consisting of land and biomes, such as grassland, (ii) fresh water environment consisting of standing water habitats (lakes, reservoirs) and running water habitats (streams, rivers). (iii) Marine environment consisting of shallow waters of the continental shelf and deeper water of the ocean. (iv) symbiotic environment consisting of two or more kinds of organisms exist together for their mutual benefit.

Ecosystem comprises of four basic components namely (i) abiotic substances, (ii) producer organisms, (iii) consumer organisms and (iv) decomposer organisms.

CONCEPT AND SCOPE OF ENVIRONMENTAL CHEMISTRY

Environment chemistry is multi-disciplinary science involving chemistry, physics, life science, agriculture, medical science, public health, sanitary engineering etc. In simple terms, it is the science of chemical phenomena in the environment. In broader terms, it is the study of the sources, reactions, transport, effect and fate of chemical species in the air, water and soil and the effect of human activity upon these.

An understanding of the basic concepts of environmental chemistry is essential not only for all chemists but also for all non-chemists engaged in environmental science, engineering and management.

A wave of concern for the environment swept across the developed countries in the sixties and reached its climax in 1970 with the celebration of 'Earth day' under the auspices of the United Nations. Then from 1972 onwards with the conclusion of the United Nations Conference on Human environment at Stockholm, this wave started sweeping across India and other developing nations. The need for environmental education, both formal and non-formal was keenly felt at the national level.

The objective of environmental education is to enlighten the public, particularly student, about the importance of protection and conservation of our environment and the need to restrain human activities which lead to indiscriminate release of pollutants into the environment. Environmental chemistry is part of environmental education.

At present there are many environmental issues, which have grown in size and complexity day by day, threaten the survival of mankind on earth. How were several Japanese killed by eating fish from Minamata Bay in

the sixties? Why did 3000 to 4000 people die in London in 1952? Why are historic marble statues in Greece and Italy getting damaged by rain water? How did the Mediterranean sea turn into a dead sea, unable to support aquatic life in fifties? Why is the Ganga river the most polluted river in India? Should plutonium breeder reactors be developed? Is saccharin a dangerous food additive? These are some typical chemical issues which can be best handled in their chemical perspective. Of course, the issues are linked with ecological, social, political and economical questions which have also to be taken into account.

ENVIRONMENTAL SEGMENTS

It is always useful to subdivide the environment to make the studies easier. In broader sense the environment can be divided into four major parts. They are: (1) atmosphere, (2) hydrosphere (3) lithosphere and (4) biosphere.

1. Atmosphere

Atmosphere refers to the protective blanket of gases which are surrounding the earth. It is able to sustain life on earth and saves it from the hostile environment of outer space. It is being able to absorb most of the high energy cosmic rays from outer space and major portion of the electromagnetic radiation from the sun. It allows entry of only harmless radiations near U.V., visible, near IR (300-2500 nm) and radio waves (0.10-40 μ) and filters out U.V. radiation below 300 nm which may damage tissues.

2. Hydrosphere

Hydrosphere refers to forms of water present in the earth system. It includes all type of water resources such as oceans, rivers, lakes, streams, glaciers, ground water, polar ice caps and other reservoirs. Most of water is 97% of earth's water lies in oceans, however, the high salt content does not allow this water to be used for human consumption. Nearly 2% of water resources gets locked in the polar ice caps and glaciers, while 1% is found as fresh water. The major uses of water include irrigation, thermal power plants, domestic and industrial consumption.

3. Lithosphere

Lithosphere refers to outer part of solid earth. In general, it refers to mineral encountered in the Earth's crust and to the complex and variable mixtures of minerals, organic matter, water and air making up soil. The most important part of lithosphere is outermost layer called soil, as most significant changes occurring in soil effect the environment most.

4. Biosphere

Biosphere refers to a kingdom of living species and their interaction with atmosphere, hydrosphere and lithosphere. In simple words, it consists of living organisms and its surroundings in which it exist. There is a direct influence of biosphere and environment on each other. This means oxygen and carbon dioxide levels in the atmosphere are entirely based upon plant animal kingdom.

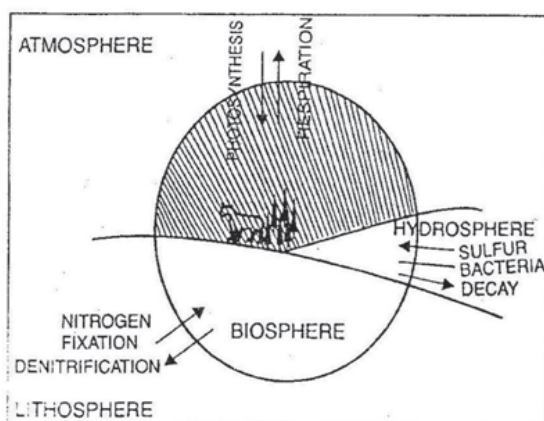


Fig- Environmental Segments

CONCLUSIONS

The area of environmental chemistry is ripe for continued growth and development. As populations continue to grow and there are more and more demands on all resources there will be an intense need for green materials, green energy sources, green processes, a green viable solutions to problems that need to be solved to promote growth in a healthy environment.

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