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RESEARCH ARTICLE

A study of why we need Environmental chemistry?

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Abstract

Environmental chemistry is the scientific study of the chemical and biochemical phenomena that occur in natural places. It should not be confused with green chemistry, which seeks to reduce potential pollution at its source. It can be defined as the study of the sources, reactions, transport, effects, and fates of chemical species in the air, soil, and water environments; and the effect of human activity on these. Environmental chemistry is an interdisciplinary science that includes atmospheric, aquatic and soil chemistry, as well as heavily relying on analytical chemistry and being related to environmental and other areas of science.
Environmental chemistry involves first understanding how the uncontaminated environment works, which chemicals in what concentrations are present naturally, and with what effects. Without this it would be impossible to accurately study the effects humans have on the environment through the release of chemicals.
Environmental chemists draw on a range of concepts from chemistry and various environmental sciences to assist in their study of what is happening to a chemical species in the environment. Important general concepts from chemistry include understanding chemical reactions and equations, solutions, units, sampling, and analytical techniques.

Introduction

A general review of factors pertaining to the chemistry of metals in sediments, soils, waters, and the atmosphere is presented in the context of risk assessment. Because the behavior of metals defies simple generalities, understanding the chemistry of the particular metal and the environment of concern is necessary. However, the factors that control metal chemistry and the environmental characteristics used to produce estimates of metal fate and effects can be generalized. In environmental chemistry, the phase the species occurs in (gas, liquid, aqueous solution, mineral, or adsorbed on an interface between phases) generally is also included in a complete definition. In the context of the environmental chemistry of metals, chemists speak of a metal species as a "specific form of an element defined as to isotopic composition, electronic or oxidation state, complex or molecular structure" and phase . Metal speciation greatly determines the behavior and toxicity of metals in the environment. Speciation refers to the occurrence of a metal in a variety of chemical forms. These forms may include free metal ions, metal complexes dissolved in solution and sorbed on solid surfaces, and metal species that have been co precipitated in major metal solids or that occur in their own solids. The speciation of a metal affects not only its toxicity but also its volatilization, photolysis, sorption, atmospheric deposition, acid/base equilibria, polymerization, complexation, electron-transfer reactions, solubility and precipitation equilibria, microbial transformations, and diffusivity. The following sections address the application of hard and soft acid and base (HSAB) concepts to metal behavior, including the formation of metal complexes, and the importance of pH and oxidation-reduction reactions to metal mobility. These sections

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also discuss the occurrence and interactions of the metals of concern in natural media (including surface and ground waters, soils and aquatic sediments, and the atmosphere). Metal sorption behavior, aging in soils, metal dissolution and transformation and transfer to plants, and methods of determining metal speciation in soils and sediments are important topics considered in these sections.

Are concerned with environmental impact

What happens to the chemicals in an industrial cleaner after you pour it into the sink? When you see black smoke pouring out of the chimney at an industrial complex, what impact is it having on the atmosphere? These are the types of questions environmental chemistry seek to answer.

The fate of chemicals in the environment and their effects are matters of increasing concern to specialists in environmental management. "Fate" involves studying where chemicals show up in streams, rivers, and air. Such pollution contains molecules that have not been removed in water treatment plants, caught by the filters in industrial smokestacks, disposed of properly, or successfully sealed in containers.

As concerns about geochemistry and the natural environment increase, environmental chemistry also study the processes that affect chemicals in the environment. Gases emitted by a pine forest may create a mist when mixed with car exhaust, for example. In other instances, the environment may have effects on chemicals that can be toxic. Environmental chemistry examine the ways both chemicals and the environment are changed by interacting.

Manage our environment

Until about 20 years ago, those studying environmental contamination focused almost exclusively on the fate and effects of chemicals because the technology to measure the damage did not exist. As the technology for measuring leakage from landfills was developed, for example, industry recognized the potential for chemicals to negatively impact the environment—and the attendant social, political, and economic ramifications. As a result of these new data, chemists were able to help design pollution abatement systems that minimize the unwanted elements escaping into the environment. They also applied their knowledge to develop remediation systems to clean up contaminated areas.

As industry takes an increasingly proactive approach to environmental management, chemistry's role should continue to grow. For many chemical companies, this may involve redeveloping a chemical product to come up with functional groups or compounds that are more compatible with the environment. For example, one major corporation

The chemical to be manufactured at the site where it is used, avoiding the risks of shipping and storing.

As waste disposal has become increasingly expensive, industry also has grown more interested in finding ways to solve waste problems. Many solutions involve making industrial processes more efficient, which cuts costs. In addition, environmental chemistry study the effects of chemicals other than pollutants on the environment.

Work in a broad-based discipline

Because our environment is so complex, environmental chemistry always underscore the interdisciplinary nature of their field. Environmental chemistry must be able to understand and use the terminology of a range of other disciplines, including biology, geology, ecology, sedimentology, mineralogy, genetics, soil and water chemistry, maths, and engineering. They may be involved in analytical testing, new product development in the lab, fieldwork with users of chemicals, and safety and regulatory issues. Many opportunities exist to move into different areas of expertise, often outside the lab. Many chemist return to school to study public policy, law, or business—applying their chemistry know-how in new ways. For example, knowledge of chemical processes is often vital for an individual who works in a corporation's regulatory affairs department and must ensure compliance with government regulations.

Environmental management is becoming a popular career track. Students who hold degrees in environmental sciences are finding jobs throughout the chemical industry, often working alongside geologists, biologists, and chemists.

Most environmental chemists emphasize that a solid foundation in chemistry is important to this work. Chemistry students interested in applying their training to an environmentally oriented job are encouraged to take courses in environmental studies. Potential employers look favorably on this as an indication of interest and ability to think in an interdisciplinary manner.

Area of Environmental chemistry

Environmental chemistry deals with the study of the origin,transport,reactions,effects,fates of chemical species in the environment.

ENVIRONMENTAL POLLUTION:-Environmental pollution is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings.A substance which causes pollution is called a pollutant.they can be solid,liquid or in the gaseous state.

ATMOSPHERIC POLLUTION:-The atmosphere that surrounds the earth is not of the same thickness at different heights.Atmospheric pollution is generally studied as tropospheric and stratospheric pollution.The ozone layer prevents about 99.5%of the sun's UV rays.

TROPOSPHERIC POLLUTION:-Tropospheric pollution occurs due to the presence of undesirable solid or gaseous particles in the air. The following are the major gaseous and particulate pollutants present in the troposphere;

Gaseous air pollutants:These are oxides of sulphur, nitrogen and carbon, hydrogen sulphide, hydrocarbons, ozone and other oxidants.

Particulate pollutants; these are dust, mist, fumes, smoke, smog etc

GLOBAL WARMING AND GREENHOUSE EFFECT:-About 75% of the solar energy reaching the earth is absorbed by the earth's surface, which increases it's temperature. The rest of the heat radiates back to the atmosphere. Some of the heat is trapped by the gases such as carbon dioxide, methane, ozone, CFCS and Water vapour. they add to t he heating of the atmosphere causing Global warming In a greenhouse, visible light passes through the transparent glass and heats up the soil and the plants. The warm soil and plants emit infrared rays, it partly reflects and partly absorbs these radiations, t his mechanism keeps the energy of the sun trapped in the greenhouse.

ACID RAIN: When the pH of the rain water drops below5.6, it is called acid rain.Acid rain is harmful for agriculture, trees and plants as it dissolves and washes away nutrients needed for their growth. It causes respiratory ailments in human beings and animals. When acid rain falls and flows as ground water to reach rivers, lakes etc. it affects plants and animal life in aquatic ecosystem.

SMOG: The word smog is derived from smoke and fog.There are two types of smog:classical and photochemical smog. Classical smog occurs in cool humid climate. It is a mixture of smoke, fog and sulphur d ioxide. It is also called reducing smog. Whereas photochemical smog occurs in warm and dry sunny climate. It has high concentration of oxidizing agents and therefore ,it is also called as oxidizing smog.

OZONE HOLE: Depletion of ozone layer is known as ozone hole.

EFFECTS OF DEPLETION OF THE OZONE LAYER: With the depletion of ozone layer, more UV radiation filters into troposphere. UV radiations lead to ageing of skin, cataract, sunburn, skin cancer, killing of many phytoplanktons, damage to fish productivity etc.

WATER POLLUTION:-contamination of water by foreign substances which make it harmful for health of animals or plants or aquatic life and make it unfit for domestic, industrial and agriculture use.

SOURCES/ CAUSES OF WATER POLLUTION-
Sewage and domestic wastes
Industrial effluents
Agriculture effluents
Siltation-mixing of soil or rock into water
Thermal pollutants
Radioactive discharge.

EUTROPHICATION: The process in which nutrient enriched water bodies support a dense plant population, which kills animal life by depriving it of oxygen and results in subsequent loss of biodiversity is known as Eutrophication
BOD: The amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water, is called Biochemical Oxygen Demand (BOD)
SOIL POLLUTION: Insecticides, pesticides and herbicides cause soil pollution

CONCLUSION

The survival of humans related an accurate interpretation of the surrounding environment gained by experience and observation. In ancient times, People were limited to the observation of the environment and making correct decisions to sustain community. Examples are the meticulous study of the heavens to predict the changing seasons, the study of mineral types to predict soil fertility, as well as the development of a vast knowledge of plant and animal diversity and behavior. Now days, sophisticated instruments allow observations and provide knowledge about every aspect of human activities including our future on this planet.
Environmental chemistry as a distinct discipline however is rather new and emerged only in the last decades of the 20th century. Environmental chemistry investigates the effects different elements, molecules or chemical products have on the environment and the species living within it. The four major pillars of

the environment are the biosphere, the atmosphere, thehydrosphere, and the geosphere. Whereas chemical reactions occur in each "sphere" separately, without interaction among the four spheres the environment would not function properly. The most prominent examples for the interaction among different environment "compartments" are the global water cycle and the elemental nutrient cycles of carbon, phosphorous, and nitrogen.

References

Alloway BJ, Ayres DC (1997) The behaviour of pollutants in the soil. In: Ayres DC (ed) Chemical principles of environmental pollution. Blackie, London, pp 395

Bennett PC, Rogers JR, Choi WJ (2001) Silicates, silicate weathering, and microbial ecology. Geomicrobiol J 18:3–19

Birkefeld A, Nowack B, Schulin R (2004) A new in-situ method to monitor mineral particle reactions under field conditions. Environ Sci Technol (submitted)

Brümmer GW (1986) Heavy metal species, mobility and availability in soils. In: Sadler PJ (ed) The importance of chemical "speciation" in environmental processes. Springer-Verlag, Berlin

Brümmer GW, Gerth J, Herms U (1986) Heavy metal species, mobility and availlability in soils. Z Pflanz Bodenkunde 149:382–398

Dudka S, Adriano DC (1997) Environmental impacts of metal ore mining and processing: a review.J Environ Qual 26:590–602

Dudka S, Ponce-Hernandez R, Tate G, Hutchinsons TC (1995) Forms of Cu, Ni and Zn in soils of Sudbury, Ontario and the metal concentrations in plants. Water Air Soil Poll 90:531–542

Ford RG, Scheinost AC, Scheckel KG, Sparks DL (1999) The link between clay mineral weathering and the stabilization of Ni surface precipitates. Environ Sci Technol 33:3140–3144

Hatton A, Ranger J, Robert M, Nys C, Bonnaud P (1987) Weathering of a mica introduced into four acidic forest soils. J Soil Sci 38:179–190

Ketterer ME, Lowry JH, Simon J, Humphries K, Novotnak MP (2001) Lead isotope and chalcophile element compositions in the environment near a zinc smelting-secondary zinc recovery facilitie,Palmerton, Pennsylvania, USA. Appl Geochem 16:207–229

Laiti E, Öhman LO (1996) Acid/base properties and phenylphosphonic acid complexation at the boe-hmite/water interface. J Colloid Interf Sci 183:441–452

Ma YB, Uren NC (1998) Transformations of heavy metals added to soil – application of a new sequen-tial extraction procedure. Geoderma 84:157–168

Roberts DR, Scheinost AC, Sparks DL (2002) Zinc speciation in a smelter-contaminated soil profile using bulk and microspectroscopic techniques. Environ Sci Technol 36:1742–1750

Schachtschabel P, Blume HP, Brümmer GW, Hartge KH, Schwertmann U, Auerswald K, Beyer L, Fischer WR, Kögel-Knabner I, Renger M, Strebel O (1998) Anthropogene Veränderungen und Belastungen.In: Scheffer F (ed) Lehrbuch der Bodenkunde. Enke, Stuttgart, pp 494

Schwarz O (2000) Polymethylmethacrylat [PMMA], Acrylglas. In: Schwarz O (ed) Kunststoffkunde. Vogel-Verlag, Würzburg

Sobanska S, Ricq N, Laboudigue A, Guillermo R, Bremard C, Laureynes J, Merlin JC, Wignacourt JP (1999) Microchemical investigations of dust emitted by a lead smelter. Environ Sci Technol 33:1334–1339

Tessier A, Campbell PGC, Bisson M (1979) Sequential extraction procedure for the speciation of par-ticulate trace metals. Anal Chem 51:844–851

Welter E, Calmano W, Mangold S, Tröger L (1999) Chemical speciation of heavy metals in soils by useof XAFS spectroscopy and electron microscopical techniques. Fresenius J Anal Chem 364:238–244