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Impact of Acid Rain on Environment

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Abstract: ***Acid rain is one of the vast environmental issues since 19th century. Acid rain is generally a blend of Nitric acid, Sulphuric acid. Acid rain consists of some constituents of atmosphere like oxides of Nitrogen or oxides of Sulphur thereby raising the acidity of water. These pollutants undergo a chemical transformation to Sulphuric acid and Nitric acid. Sulphurdioxide and Nitrogen oxides easily dissolve in water thereby producing more acidic pollutants like Sulphuric acid (H_2SO_4) and Nitric acid (HNO_3). Lowering of pH increases probability of toxic heavy metal in the soil. It reduces the soil fertility and thus affects the productivity of forest trees and plants. Acidification of water bodies also causes harmful affect on aquatic organisms. This paper is all about the environmental issue and affect of acid rain on environment. Carbon dioxide which is produced by decomposition of carbon containing organic compound is the primary source of acidity in unpolluted rainwater. The paper methodology is purely on the secondary resources. It also affects the human health, surface water, some manmade materials.***

Keywords: ***Acid Rain, Environmental Issues, Acidification, Sulphurdioxide.***

I. INTRODUCTION

Acid rain is firstly observed in Europe in the mid 19th century. An English scientist Robert Angus Smith defined the term 'Acid Rain' as he noticed that precipitation of acid damages leaves. Acid rain has higher acid content than unpolluted rain because acid rain is contaminated with nitric acid and sulphuric acid. Acid rain effect the living organisms, aquatic plants and aquatic elements. Acid rain damage some manmade monuments like Taj Mahal of Agra. Acidic rain includes acidic rain, fog, snow and hail. It is produced from the oxides of sulphur and oxides of nitrogen. Acid rain is the most serious environmental problem produce due to air pollution. It is damaging the natural things like manmade monuments like Taj Mahal, also polluting lakes, river, forests and preventing the growth of soil. Although rain is naturally acidic. The pH of rain is becoming very low due to increase pollution everywhere because of the increase in the concentration of nitrogen oxides and carbon dioxide.

II. METHODOLOGY

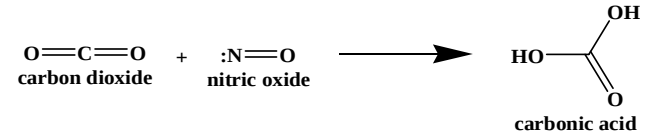
The acidity of rainfall is measured on the pH scale which lies between 0 to 14. pH value 7 is a neutral solution. A solution having pH value less than 7 is acidic in nature and pH value greater than 7 is basic in nature. The rain water having pH less than 5.6 is considered to be acid rain.This acid rain's pH and the chemicals that cause acid rain are monitored by two networks that are supported by EPA. The NADP (National Atmospheric Deposition Program) measures wet deposition, and its network site features maps of rainfall pH and other important precipitation chemistry measurements. The CASTNET (Clean Air Status and Trends Network) measures dry deposition.

III. COMPONENTS OF ACID RAIN

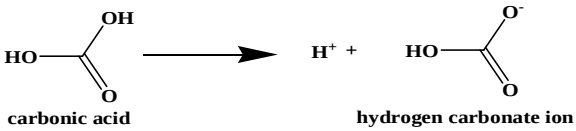
The major components of acid rain are sulphur dioxide, sulphur trioxide, nitrogen oxides, carbon dioxide which dissolves in rainwater and form acid rain by decreasing the pH of rainwater.

The chemical reaction of these pollutants are discussed below:

Carbon dioxide reacts with water to form carbonic acid (equation 1) which decomposes into H+ ion and thus lowering the pH of the solution (equation 2)



1)



2)

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3) Nitric oxide also plays a role in lowering the pH of the solution. In the presence of atmospheric oxygen nitric oxide converts into nitrogen dioxide(equation 3)

$$NO(g) + 1/2\ O_2(g) \longrightarrow NO_2(g)$$

4) The nitrogen dioxide produced by oxidation of nitric oxide react with water to form nitric acid and thus lowers the pH of the solution(equation 4)

$$3NO_2(g) + H_2O \longrightarrow 2\ HNO_3(aq.) + NO(g)$$

5) Sulphur dioxide and sulphur trioxide reacts with water to form sulphurous acid and sulphuric acid thereby decreasing the pH of rain water.

$$SO_2 + H_2O \longrightarrow H_2SO_3$$

A. Cause For The Formation Of Acid Rain

Human activities and some natural resources are the main factors for the formation of acid rain. Human activities like burning of coal, use of oil and natural gas to produce electricity, cooking purposes and running the vehicles increases the amount of sulphur and nitrogen oxides and also carbon dioxide and thus produce acid rain by dissolving in rain water. Thus it pollute river water, lakes, ponds.

IV. EFFECTS OF ACID RAIN

A. Effect On Surface Water

The rain containing acid releases aluminum from the soil and dump into lakes and rivers which is very harmful to aquatic organisms. Water acidification increases the release of the aluminum ion from granite rocks. In eastern Canada, about 13500 lakes are found to be acidic.

B. Effect Of Acid Rain On Health

It is the invisible form of pollution also possesses some harmful effect on human health. The nitrogen oxides and sulfur dioxide which produce acid rain cause harmful effect on health. These gases can be transported by long distance and inhaled by humans cause lungs disease such as Asthma and bronchitis also dry cough, headache.

C. Effect On Forest

Acid rain damages plants and forests by preventing their growth. Leaves turn brown and fall off due to acid rain. It also damages the root system. It can directly damage the plant tissues, reduce canopy cover and the whole tree death.

D. Effect On Manmade Structures

Acid rain damages manmade monuments. Due to acid rain paints on monuments washed away. Taj Mahal is the greatest example of it. Generally, these monuments are made up of limestones and Marble which consist of $CaCO_3$(Calcium Carbonate) which dissolves in the acid rain producing aqueous ions which in turn washed away in the water flow.

$$CaCO_3 + H_2SO_4 \longrightarrow Ca^{2+} + SO_4^{2-} + H_2O + CO_2$$

E. Effect On Transport

Currently both the airplane industry and the railway industry spending a lot of money to repair the corrosive harm done by acid rain. In the past decades, various bridges have been fallen off due to corrosion.

F. Effect on aquatic life

The acid rain also causes harm to aquatic animals. Acidic character of water bodies stops eggs of the aquatic organism like fish to stop hatching. It also disturbs the ecosystem.

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V. HOW TO PREVENT ENVIRONMENT FROM ACID RAIN

There are various ways to reduce acid rain:

A. Cleanup Smokestacks And Exhaust Pipes

In the modern world, the use of fossil fuels like coal, oil and natural gas is increasing day by day. These fuels are the main cause of production of acid rain. Coal fuels accounts for the emission of sulphur oxides and nitrogen oxides. Sulphur is present as an impurity in the coal and reacts with atmospheric oxygen to produce sulphur dioxide and thus react with rain water to produce sulphuric acid. Nitrogen oxides produced by burning of fossil fuels and play a major role in acid rain. The emission of sulphurdioxide can be reduced by using coal containing less amount of sulphur, washing the coal and by the use of scrubbers to remove sulphur oxides from the gases leaving from smokestacks.

B. Use Alternative Energy Sources

The use of fossil fuels should be reduced. There are many other energy sources like nuclear power, hydropower, wind energy and solar energy. These another sources of energy can also be used for the reduction in acid rain.

VI. CONCLUSION

The pH of acid rain is considered to be less than 5.6. It is produced by the reaction of rain water by sulphur oxides and nitrogen oxides to produce sulphuric acid and nitric acid respectively thereby increasing the acidic character of rain. Natural gases, coal and oil are the major cause for production of acid rain. Acid rain is very harmful for plants, animals, forests, aquatic life and for transport system. The production of acid rain can be reduced by the limited use of fossil fuels.

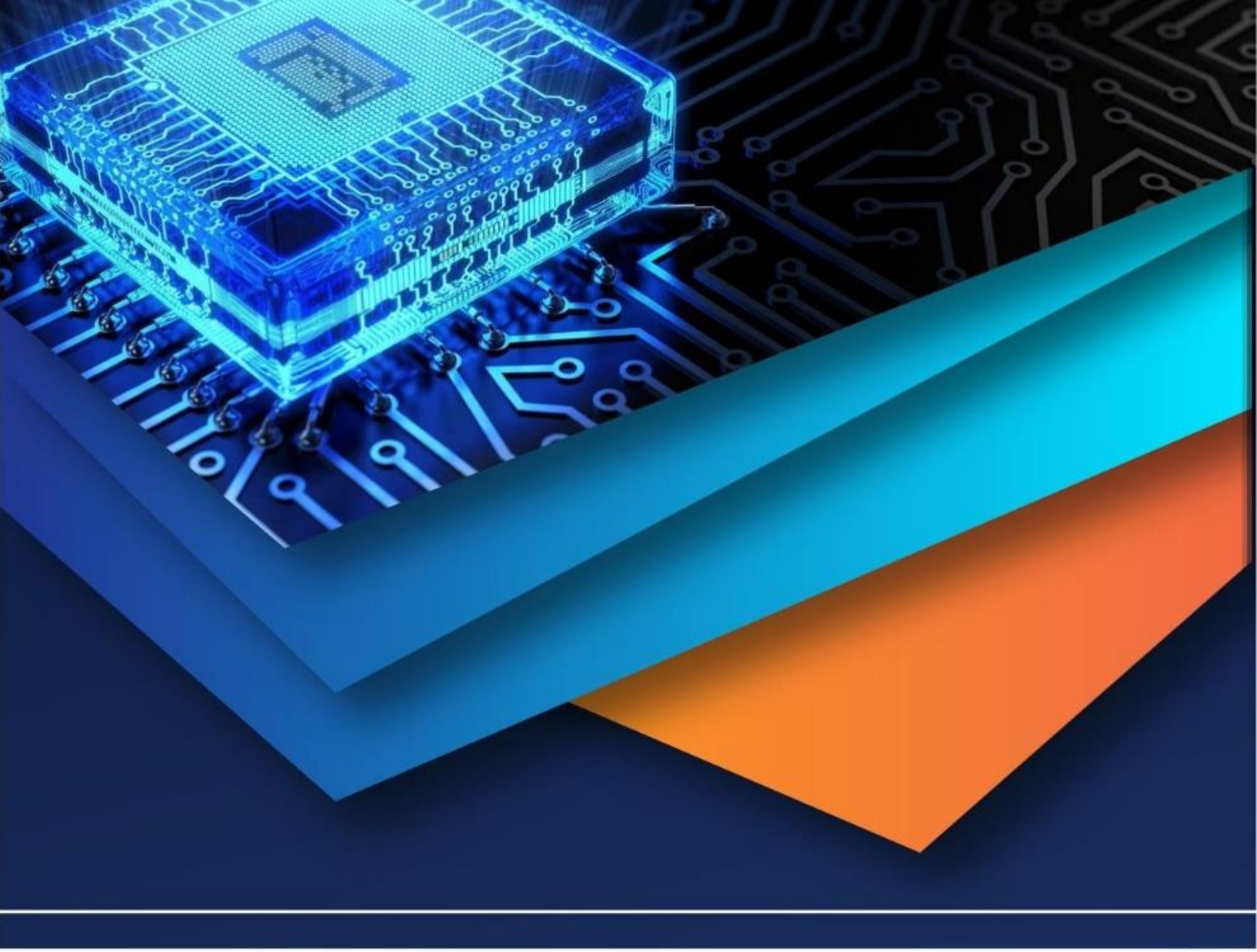
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REFERENCES

[1] Wondyfraw M, “Mechanism and Effect of Acid Rain on Environment”, “Journal of Earth Science and Climate Change”, Vol. 5(6), 2014
[2] Subodh Kumar, “ Acid rain: The major cause of pollution: its causes, effects”, “International journal of Applied Chemistry”, Vol 13, Number 1, 2017, pp. 53-58
[3] Anita Singh, Madhoolika Agrawal, “Acid rain and its economical consequences”, “ Journal of Environmental Biology”, Vol 29(1), 2008
[4] Amit Parihar, ”Impact of Acid Rain on Human Health”, “Indian Journal of Research”, Vol 5(4),2016
[5] http://en.wikipedia.org/wiki/Acid_rain
[6] http://www.epa.gov/acidrain/education/site_students/phscale.html
[7] http://www.ec.gc.ca/acidrain/acidfact.html
[8] http://www.environment.no/templates/themepage_2149.aspx
[9] Dubey, S., (2013), Acid Rain-The Major Cause of Pollution: Its Causes, Effects and Solution, International Journal of Scientific Engineering and Technology,2(8), 772-775.
[10] Acid Rain,” 1995 Information Please ™ Almanac, Annual 1995, p.579.

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