

## Acid Rain Status in India – an update

Growth of economy of a country mainly depends on the amount of use of energy resources. As India is among the fastest growing countries with regard to economy, the natural consequence one can draw of it is that there has been massive increase in the current use of energy resources in different public/private sectors. This reflects in the fact emission of air pollutants in India has drastically increased with the passage of time mainly on account of the anthropogenic activity. Use of resources is a time-honoured necessity for the growth and development of civilisation, but the other side of it is that it has led to several adverse consequences of it, as one in the form of acid rain which may have many fold detrimental impact on the society.

Acid rain is caused mainly by the presence of sulphuric and nitric acids in the rain water which are results of oxidation of sulphur and nitrogen contents emitted in the atmosphere mainly through bio-fuel, fossil fuel and bio-mass burning in the vehicles, industries, thermal power plants, etc. Transports of oxides of nitrogen and sulphur from a source region to a region of less availability of potential acid neutralizer (e.g.  $\text{CaCO}_3$ ,  $\text{MgCO}_3$ ,  $\text{Ca}(\text{OH})_2$ ,  $\text{NH}_3$  etc.) may also lead to acidification of precipitation particles there.

From the chemistry point of view, a water sample showing pH value equal to 7 is said to be neutral. However, while dealing with the acidity/alkalinity of rain water in the atmospheric sciences, a pH value range of 5.6-5.65 is taken as the reference value (i.e., neutral pH-value range) to decide whether the rain water is acidic, neutral or alkaline. This is because of the partial dissolution of atmosphere  $\text{CO}_2$  in the rain water causing presence of weak carbonic acid ( $\text{H}_2\text{CO}_3$ ) in the rain water which lowers its pH value. Thus, while dealing with rain water acidity a pH value range 5.6-5.65 is taken as pure water neutrality in equilibrium with atmospheric  $\text{CO}_2$ .

There have been meagre reports of acid rain in India in the past and that too have been only the episodic.

Reported acid precipitations in India includes the acid rain in Chembur and Colaba industrial areas of Mumbai, in the vicinity of Singrauli Super thermal Power Plant ( average pH value 5.3), at a rural site of Bhubaneswar (median pH value 5.0) and the Silent Valley (pH=5.3). Latest reports on acid rain are at Kalyan (pH=5.28), Chembur (pH=4.8), Sinhagad (pH=5.2), Delhi (pH<5.6) and very recently at Panipat (pH<5.6) of National Capital Region of Delhi. Although the pH value of rainwater at Pune has been reported to lie in the alkaline range, its value has shown decreasing trend from value of 7.5 in 1986 to 6.2 in 1998. The main reason is attributed to the decrease in the level of calcium ion and increase in sulphate and nitrate ions. Rain fall in Agra and Delhi regions have also shown decrease in pH value with the passage of time. Thus, it is a situation which alarms to have control over the emission not only in these regions but in other regions also.

It has been found that potential neutralizer of the acidic components of rain water in Indian region is Calcium which is mainly naturally derived from the soil. As the soil of the most part of Indian land is Calcareous, it contains abundance of calcium. So, the Indian soil has as yet put a check on the acidification of rain water, but how long? So, it is advised to every individual of the society, particularly in benevolence to the living beings, to be aware of alarming levels of various unwanted anthropogenic emissions and neutralisation potential of the naturally derived metallic components, abstain from the activity causing dangerous emissions and dissuade the others and try to search for alternatives causing diminished or nil emissions. Otherwise, it would lead to potential chemical hazardous phenomena like acid rain.

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