

Studies of metal transport phase in river around Jamshedpur

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ABSTRACT

Studies of transport phase of four metals mainly Fe,Zn,Mn,Cd in the river water and discharge sample of Subharnrekha river around Jamshedpur, were carried out in 2011. The fractionation analysis of sediments the river water and waste sediments for the four metals important phase like adsorbed/ion exchangeable, oxide coating, organic solid & crystalline phase were carried out by atomic absorption spectrophotometer, the result has been discussed & concentration of metals available to the biota has been estimated.

Keywords: adsorbed / ion exchangeable

[1] INTRODUCTION

The study of effect of pollutants on water quality is of importance, the highly polluted water with heavy metals is not suitable for irrigation purposes as well as zoological point of view.

The study of partitioning of the metals amongst the several particulate phases in aquatic system is of importance because it is the major factor for controlling metals availability & toxicity to biota.

[2] Experimental:-

Sampling site

Subarnarekha River

A) Baridih in July 2011

B) Bagunhatu in September 2011

The river water & the discharge water samples were collected in plastic bottle of 2Ls from the discharge point in the river. The water sample is transferred into 1L measuring flask separately & filtered through whatman filter paper-42, in all cases the residues were treated as follows:

Residue-1

The residues obtained after filtration of discharge sample along with filter paper was treated with 20ml aqua-regia & heated for half an hour over water bath. It was then filtered through whatman filter paper No.-42, the filtrate obtained, diluted to 500ml with the help of distilled water. This sample is used for determination of total metal concentration.

Residue-2

The residue obtained after filtration of discharge sample from discharge point is leached with 50 ml of 0.5N MgCl₂.6H₂O solution with the help of magnetic stirrer for nearly 7 hours from time to time & then filtered through whatman filter paper, the filtrate was then made to 500ml with distilled water in the volumetric flask for determination of

adsorbed &/or ion exchangeable heavy metal (Eisenreich *et al* 1980).

The residue over the filter paper itself was leached with 0.4(N) sodium pyrophosphate solution (Na₂P₂O₇) made to 500ml for determination of heavy metals associated with organic solid.

The residue along with filter paper then treated with 50ml of 0.5 (N) HCL solutions & heated over water bath for half an hour & filtered, the filtrate was then made upto 500ml, the heavy metal in oxide coating were determined in the filtrate.

The residue along with filter paper finally treated with 20ml aqua regia & heated in water bath for half an hour & filtered, the filtrate was made upto 250ml. This filtrate was used for determination of metal in crystalline phase.

The same processes were repeated for other samples which were collected 1km away from the discharge point for determination of heavy metals concentration in different phases.

DISCHARGE - POINT JULY 2011

Table :-1

| Sample | Fe | Zn | Co | Mn | Cd |
|--------|-------|-------|----|--------|----|
| I | NF | 0.094 | NF | 0.0492 | NF |
| II | 0.114 | 0.24 | NF | 0.017 | NF |
| III | 3.861 | 1.15 | NF | 0.0513 | NF |
| IV | 2.609 | 1.61 | NF | 0.1607 | NF |
| V | 7.846 | 3.33 | NF | 0.3447 | NF |

I = Adsorbed phase,

II = Organic solid phase,

III = Oxide coating phase,

IV = Crystalline phase

V = Total metal concentration

**1KM AWAY FROM DISCHARGE POINT
(River water sample)**

Table:2

| Sample | Fe | Zn | Co | Mn | Cd |
|--------|--------|-------|----|-------|----|
| I | 0.024 | 0.140 | NF | NF | NF |
| II | 2.002 | 0.110 | NF | 0.014 | NF |
| III | 5.894 | 1.320 | NF | 0.034 | NF |
| IV | 1.2912 | 0.590 | NF | 0.197 | NF |
| V | 9.989 | 2.560 | NF | 0.265 | NF |

Table:3

| Sample | Fe | Zn | Co | Mn | Cd |
|--------|-------|-------|----|-------|----|
| I | 0.499 | 0.70 | NF | 0.259 | NF |
| II | 2.933 | 0.211 | NF | 0.057 | NF |
| III | 3.933 | 0.211 | NF | 0.057 | NF |
| Iv | 1.088 | 0.204 | NF | 0.187 | NF |
| V | 7.156 | 1.505 | NF | 0.406 | NF |

**1KM AWAY FROM DISCHARGE POINT
(River water sample)**

| Sample | Fe | Zn | Co | Mn | Cd |
|--------|-------|-------|----|-------|----|
| I | 0.471 | 0.48 | NF | 0.14 | NF |
| II | 2.324 | 0.19 | NF | 0.052 | NF |
| III | 3.988 | 0.70 | NF | 0.045 | NF |
| IV | 1.680 | 0.62 | NF | 0.429 | NF |
| V | 8.174 | 1.611 | NF | 0.648 | NF |

Table:4

I = Adsorbed phase **II = Organic solid phase**
III = Oxide coating phase **IV = Crystalline phase**
V = Total metal concentration

[3] Result and Discussion:-

Chemical parameter for the sample at different site Baridih & Bagan of Subarnrekha river are given in the table I, II, III & IV.

Among the heavy metal iron occurs in much higher concentration in these sites in Subarnrekha river in discharge point sample and river water sample for July to September 2011 varied from 7.156 to 9.89 mg/l. The total Mn content were in the range of 0.265 to 0.648 mg/l and total Zn metal concentration were in the range of 1.505 to 3.33 mg/l. The Co & Cd metal concentration was however found to be negligible and almost nil.

The partitioning of iron in different form reveals that the dominant phase is oxide coating phase. The more common transport phase behavior for iron in river water is oxide coating > organic solid > crystalline > adsorped phase. This finding is in contrast to what H. S. Mishra (1988) found in his study.

The transportation of iron in different phases in the month of July 2011 in the discharge sample were found to be oxide coating > crystalline > Organic solid and in September 2011 Oxide coating > organic solid > crystalline > adsorped

phase.

The more common transport phase behavior for iron in the river water is Crystalln month of Sine > Oxide > Organic > adsorbed. Phase. Mn concentration in different phases as analysed by A.A.S in river water sample were as follows:

In the month of Sept 2011: crystalline > adsorbed > oxide coating > organic solid.

Mn is in different phases in discharge sample were found to In the month of July 2011: crystalline > oxide coating > organic solid.

Mn is different phases in discharge sample were found to be as follows:

In the month of September 2011: Adsorbed > crystalline > oxide coating = organic solid .

The concentration of Zn metal in different phases in river water sample for both the months July & sept 2011 were found as oxide coating crystalline > adsorbed phase > organic solids.

Zn metal concentration in different phases in discharge sample is as follows:

In month of July 2011, crystalline > oxide coating > organic solids > adsorbed

In month of Sept. 2011 adsorbed phase > oxide coating = organic solids > crystalline. The concentrations of heavy metals Cd & Co in different phases in river water as well as discharge sample were found to be nil.

Conclusion:

From the above data about the occurrence of Fe, Mn, Co, Zn, Ni, Pb in available and unavailable metal phase would help in determining the effect of various metal in irrigation & aquatic life . The higher concentration of heavy metals in water prevent of self purification of water and thereby produces adverse effect at aquatic lives.

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