SURVEY ON PHYSICO-CHEMICAL INVESTIGATION AND IDENTIFICATION OF TOXIC COMPOUNDS IN MANDIDEEP INDUSTRIAL AREA

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ABSTRACT

The thesis consists of six chapters/sections under the broad headings of –Section1-"Introduction"; Section2-"Review of literatures"; Section3-"Research gap and problem formulations"; Section4-"Physico-chemical investigation"; Section5-"Toxic compound identification of industrial solid waste"; Section6-"Conclusion and further aspects";

The copper, Cu concentration was varied from 57.80 to 373.101 mg/Kg and highest Cu concentration was found at site-II (Around Pradeep insecticides and fertilizers co. Pvt. Ltd

The Cadmium, values were lies between 4.15-18.37mg/Kg and the highest average value of Cd concentration level was measured as 18.37 at site-II (Around Pradeep insecticides and fertilizers co. Pvt. Ltd.).

The Chromium, Cr, concentration was varied from 4.15 to 18.37 mg/Kg and the highest Cr concentration level was measured at site-II (Around Pradeep insecticides and fertilizers co. Pvt. Ltd.).

The Iron, Fe, content in samples was varied from 0.98 to 5.04 mg/Kg and the highest total Fe concentration was measured at site-V (around Tirupati industries).

The Lead, Pb concentration was varied from 19.25 to 89.00 mg/Kg and the highest Pb concentration was found at site-I (Around Pooja chemicals).

TheZinc, Zn, concentration was varied from 69.45 to 273.18 mg/Kg andthe highest Zn concentration was found at site-I (around Pooja chemicals).

The Arsenic, As, concentration varied from 20.36 to 63.18 mg/Kgand the highest As concentration were highest at site-II (around Pradeep insecticides and fertilizers co. Pvt. Ltd.).

Solid waste samples of Mandideep area consists of toxic compounds like Cd, Cu, Cr, Pb, Fe, Zn and As contents in high concentration which persists more in the environment due to this reason the special attention and scientific planed new ideas and strategies which must be dealt with the solid waste made by the industries. Therefore it may verify the resources instead of the solid wastes which are pointing below.

- *Solid Waste Management's requires the great importance of which it must be truly dealt with by the government/civic bodies to give solid waste management services appropriately to the peoples. Open lack of concern and low societal position allotted from the activities made by the S.W.M. by the civic/public bodies are an extraordinary obstacle in taking care of this issue.*
- *According to the stringent laws it should be passed through the proper disposals as well as proper treatments of the wastes.*
- *There will be no new schemes/plans should be passed for any of the private, business and industries until and unless if it have not the best possible place for the disposals as well as treatments of its wastes. In India there is a strong example of private section co-activity in Mandideep industrial zone, Bhopal, Madhya Pradesh and private area can be go with its capacity, development, capital, improved and capably administrations. The participation of public is of a fundamental significance which can give enormous outcomes if look for appropriately.*

Key words: *Industrial effluents, physicochemical properties, Heavy metals, pollution, Parameters; Physicochemical; Heavy metals, WHO*

1. Introduction

1.1 Sources of solid waste in Mandideep industrial area, Bhopal

The solid wastes are the wastes generated from the activities done by the animals and the humans that are generally solids and are eliminated as unwanted or useless by the persons and the organisations that produces the solid waste.

- Residential sources: from the industrials as well as the residential areas. In most of the wards of Mandideep area the huge sources of the generation of solid wastes are the residential and industrial area of Mandideep.
- Commercial sources: Establishments and businesses such as shops, foods and drinks, banks, etc.
- Institutional sources: Government institutions as well as public institutions e.g. schools, colleges, universities, religious institutions, offices, prisons, etc.
- Open areas: The wastes from road side dustbin, ditches, street sweepings as well as the various public places.
- Industrial sources: The wastes due to the various processes from the industries.
- Health facilities: The wastes due to hospitals as well as from the various health facilities.
- Construction and demolition: wastes due to different types of the construction as well as destruction activities in the town/urban regions such as building of the flats/apartments, urban and slums demolitions, etc.
- Agricultural sources: wastes due to plantation which is mostly normal in peril urban and rural areas of the small, medium as well as large Ethiopia towns.
- Electrical and Electronic waste (e-wastes): the wastes from the electronics components and devices such as radios, computers, phones, etc. and the industrial equipment such as cookers, batteries, washing-machines, etc.

Due to this, a few less attentions are given to the industrial solid wastes and the accurate quantities produced by industries are not known. However, the WASH workers in villages and urban areas are very useful to know the indications and sources of the solid wastes so that we have to:

- Suggest the potential health awareness to the workers as well as over the environmental hazardous for carrying out the solid waste.
- Suggests the better advise over the hospitality treatments, transportations, as well as the neededs of the disposal systems.
- Developments of the procedures and precautions to protect the humans at the time of the collections and disposals.
- Good understanding for the determination of varieties of the generated solid wastes by any one of the specific industry that can be determinate along with the commercial and by the industrial wastes.

1.2 Summary of the present Investigation

The present investigation covers **SIX CHAPTERS**.

Their summary has been described briefly as follows

Chapter I presents introduction of solid waste generation status in the world, in India and in Madhya Pradesh.

Chapter II covers the literature reviews on physico-chemical characterisation and toxic compounds

Chapter III Reported the selection of study area, Bhopal, Madhya Pradesh, India. The solid waste samples of five locations of Mandideep Industrial area, namely around Pooja chemicals, around Pradeep insecticides and fertilizers co. Pvt. Ltd, around standard surfactant limted, around Suveesha chemicals Pvt. Ltd and around Tirupati Industries are collected in the month of July-2017 to Sept.-2017 for Phase-I, Oct.-2017 to Dec.-2017 for Phase-II, Jan.-2018 to March-2018 for Phase-III and April-2018 to June-2018 for Phase-IV.

Chapter IV Describes the parameters of physico-chemical for the solid waste samples such as moisture content, pH(Potentio Hydrogenie), electrical conductivity, TOC, TCC, TN, Sulphate, Phosphate, C/N-ratio , N/P-ratio, Calcium, Magnesium and Chlorides are analysed with standard analytical method.

Chapter V Deals with the identification of toxic compound in solid waste samples by Atomic Absorption spectrophotometers.

Chapter VI Includes the conclusion and future scopes of present investigation were discussed.

1.3   Pollution by toxic compound

Air pollution of an environment with the heavy-metals is a worldwide fatality that is identified with activities from the humans such as electroplating, fossorial, melting, power, electricity, as well as production of gasoline, transmission quality, serious horticulture, slime dumping and softening activity (Igwe and Abia, 2006).

The heavy metals of all types are at high consideration and produce highly toxic outcomes and are considered as ecological pollutants (Sawidis, 2008). The evaluation of bio-availability of pollutant in biological ecosystem is a powerful sign of their toxicity quality. In latest years, soil polluted by heavy metals that has reached out because of human activities and removal of such pollution has additionally been of top notch concern. The heavymetals are presently not biodegradable and that have a tendency to accumulate in biological systems. The environment has been discovered to take in pollutants or clean up itself via herbal biological/biochemical activities for this reason the increasing use of plant to remediate to the environment. Plants can accumulate and magnify hint pollutants like heavy metals to a level that is poisonous to lives (Qasem et.al. 2006). The heavy metals are factorised with relatively high atomic mass (generally increased than 6g/cm^3, for example, Cd, Cu, Zn, Ni, Al, Mo, Sn and so on., and also semi metals such as B, Te, As and Se, as recorded through occupational protection as well as from the health organization (Vijayarengan, 2012). Agricultural soils available in numerous parts of the world are somewhat excessively marginally contaminated by toxicity of the heavy metallic. Heavy metals are most widely associated with predominating class of ecological pollution as they can remains in the surroundings for extensive time periods: their aggregation is likely unsafe and is too hazardous to the animal and humans and vegetation (Abdul Jaleel et.al., 2009, Jayakumar et.al., 2008).

The concentrations of excessive metallic contaminations in the soils can ends with the results in decreased soil microbial recreation, yield losses and soil fertility (Seliga, et.al. 1993). The Trace components are very crucial for the continuous functions of the metabolic elements of the plant, however at more prominent concentrations, these metals are more toxic and also cause the seriously interrupt with physiological and biochemical capacities.

Although some metals are motionless and persistent, different metals are mobile, and therefore, the Zn, Fe and Cd are three vital micronutrients for plant nutrition. Plants are true environmental best warning signs and reply without delay to air, soil and water best (Diaz and Massol Deya, 2003, Kabata-pendias, 2000). Since the plants can normally draw the contamination from their local condition, their compound arrangement can show the certificate of aggravations when surveyed contrary to history esteems got from the vegetation's which are not polluted(Massol-Deya et.al., 2005).

Numerous researchers and analysts have been confirmed that plants are incredible in purging up pollutant soil (Wenzel et al., 1999). Phytoremediation is an ordinary term for utilizing vegetations life to evacuate, contain soil pollution, for example, heavymetals, solvents, pesticides, unrefined petroleum, landfill leacheates and polyaromatic hydrocarbons.

Long time and tremendous utilization of agricultural lands with recognizable programming software for developing practices and utilization of pesticides (Nicholson et al., 2003). It may cause the formation of heavy metals, for example, zinc, iron, and cadmium to be firmly gathered in the topsoil.

1.4 Research gap

Industrial wastages are the major source of pollution of heavy metals in India due to because of insufficient wastewater treatment methods. Heavy metals are very harmful to the humans as well as to the animals, keeping to aggregate in the food chain. Tanneries and refineries are most important source of the following minerals like Zn, Pb,Cd,Ni,Cr, Fe, Mn and Cu are creating more environmental pollution. Likewise, mining metallurgical exercises, purifying of metal minerals and composts have added to significant level of heavy metal focuses in the earth. Chromium is one of the most poison and lethal heavy metals which will disintegrate with nature.

The contamination in soil and wastewater because of heavy metal is a critical issue or the natural. Wastewaters from the businesses and the sewage muck use have perpetual lethal impacts on the human and to the earth. Cadmium is additionally one of the most lethal and contaminations to the surface layer of soils, and is discharged into nature due to atmospheric statement from the metallurgical industries, mining and refining exercises, cremation of the plastics and the batteries, the land application for the sewage and slime, and copying of the non-renewable energy sources (Tang et al., 2006). Enacted carbons arranged structure rice husk, tamarind nut and nut bodies have been effectively utilized for the expulsion or Cr (VI), Hg (II) Cd (II) and Ni (II) structure watery arrangement. The residue from the coconut oilcake is the extremely compelling adsorbent for the recuperation and expulsion of Ni (II) from the fluid arrangement. Its adsorption limit is modestly high to business enacted carbon.

Hexavalent chromium and trivalent chromium are the most common types of chromium in the regular habitat. Significant wellsprings of chromium contamination incorporate effluents from calfskin tanning, chromium electroplating, wood protection, compound planning and atomic squanders because of its utilization as an erosion inhibitor in atomic force plants. In contrast to natural contaminants, metals are not degradable and in this manner

stay in the earth for significant stretches of time; when present at high focuses, metals can contrarily influence plant digestion.

2. PHYSICO-CHEMICAL INVESTIGATION

The information on the physicochemical properties for alternative potential chemical is a prerequisite of the alternative evaluation process for two reasons. 1st the chemical hazardus, which is capable of tampering the normal biological process and the ability to alter physical hazardous and ecological fortune are calculated by the immanent physico-chemical properties and the method by which it is interacting. For the inorganic and organic chemicals, these endogenous properties are dictated by the sub-atomic structure or molecular structures, while for the elementary materials, which are find out by the size, structure, composition and morphology. 2[nd]physio chemical propertieswill be used to remove from the consideration of chemicals thought that are probably going to beexhibit physical hazards and specific toxicological. In fact,obtaining of these information is generally reasonable and very quick, and can be rapidlycompleted at the initial phases of an alternative assessment(National Academies Press, U.S., 2014).

2.1 Content determination of TOC and TOM
The determination of TOM and TOC contents can be done by techniques explained inOsuji, L.C. &S.O. Adesiyan, et al., 2005.Each air-dried soil test (0.5 g) was placed into funnel shaped flask, with mixed solution of $1NK_2Cr_2O_7$. And then 2.5 ml was included in the solution. The tests were gently swirled to mix the sample. And then $H_2SO_4$of 5 ml was added rapidly, and flask was swirled gradually, until the proper mixing of the test sample and their reagents, lastly we need to swirledvigorously for approximately for 1 minute. Then the flask was permitted to remain in a smoke cupboard for at least 30 minute. At that point, 5 ± 10 drops of diphenylamine pointer were added to the solution and the test probe were titrated against the solution of 0.5N $FeSO_4$to a maroon colour. Then the standardized dichromate was carried out by the blank determination.

Thecontents ofTOC and TOM(in %) can be calculated by the following equation [2] and [3] as follows:

$$TOC \{\%\} = [meq(K_2Cr_2O_7) \pm meq(FeSO_4)] - meq(C)\frac{f \times 100}{W} \qquad [2]$$

$$TOM \{\%\} = \frac{431}{250}TOC \qquad [3]$$

Where,
f = Correction factor and its values is approximately 1.3,
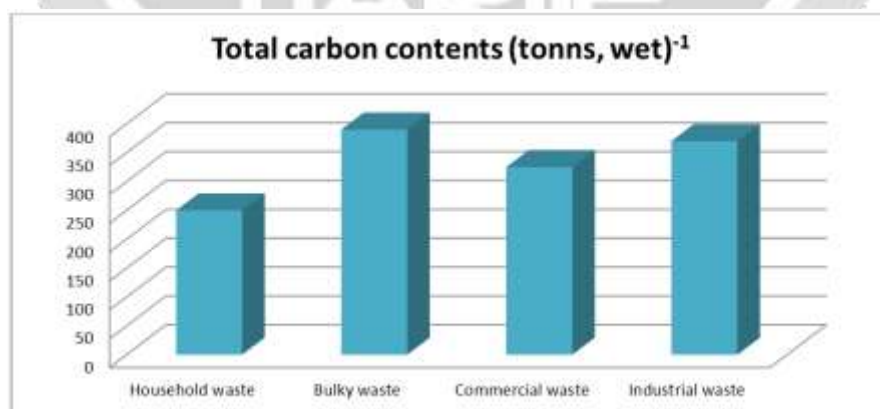meq= Milli Equivalent Weight in g,
W=Weight of the sample (in g).

Figure1.1: Represents the total carbon contents (tons, wet)$^{-1}$ in four types of waste.

2.2 Total Nitrogen
The arrangement of the samples for titration process is comprised of two stages:

a) **Digestion:** In this processes, we have to add the substances of a complex type to the sample and then we have to heat the solution to a particular temperature to change it into the $(NH_4)SO_4$.

b) **Distillation process:** In this process, we have to saturate the samples, for the proper condensate we have to use an acid to it and finally use these mixtures for the process of the titration.

Reagents:

1) **Digestion reagent:**
   - Dissolved solution of K_2SO_4 of weight 133.99gram and $CuSO_4$ of the weight 7.29g in the solution of 800ml of dH_2O
   - Then gently add conc. H_2SO_4 of 134ml to the solution
   - And finally dilute the solution to 1000ml by dH_2O
2) **Sodium hydroxide- sodium thiosulfate reagent:**
   - Take the dissolved solution of NaOH of weight 500g
   - And then mixed $Na_2S_2O_3.5H_2O$ of weight 25g to the above solution
   - And then dilute the solution to 1000ml by dH_2O
   - Finally dilute the solution up to 1L
3) **Mixed indicator solution (one month)**
   Dissolved solution of Methyl Red indicator of quantity 200mg in the mixtures of dissolve 100mg of blue methylene in 50ml in which 95% is ethyl or isopropyl alcohol, and 100ml in which 95% is ethyl or isopropyl Alcohol, combined solution.
1) **Indicating boric acid solution**
   In the distilled mixture of ammonia free we have to add H_3BO_3 of quantity 20.0g, and then we have to add a mixed indicator of 10ml, finally dilute the solution to 1L of dH_2O.
2) **Standard sulfuric-acid titrant 0.02N**

Apparatus:
1) Distillation equipment
2) Hot plate, and
3) Different equipment's such as separate cylinder, burette, pipette

Procedures:

1) In the 500ml of kjeldal-flask, we have to put sewage-water sample of 25ml or simple water sample of 50ml and then we have to keep the glass beads which are used to prevent the formation of the bulbs.
2) Now we have to add the digestion solution of 50ml.
3) And then we have to add the glass beads.
4) To remove the acid fumes we have to heat under the hood.
5) Continuous heating of digestion till the colored sample will not become transparent or turbid and the pale green.
6) Dilute the solution to 300 by dH_2O after cooling.
7) Mixed the solution properly.
8) Add the followings by carefully after tilting the flask:
   - For the formations of the alkaline-layers at the flask's bottom we have to add $Na_2S_2O_3$ and NaOH of 50ml
   - Steamed out the distillation equipment's just by connect the flask and shake the flask foe proper mixing, and hence there is a quick formation of HgS block for which **pH >11.**
9) Distilled; collect absorbent solution of 200ml of distillate which must be below the surface of 50ml that indicates the solution of boric-acid
   - Violet or lavender will be the color
   - Color of solution starts changes to pale green as the distillation proceeds.
   - Titrate with H_2SO_4 of 0.02N; when the green color of the solution is changes to violet color then the end point is obtained

2.3 Sulphate (SO_4^{-2})

Reagents and standards

I.   SolutionBuffer A: Dissolved $MgCl_2.6H_2O$ i.e. Magnesium chloride of quantity 30g, with 20mL CH_3COOH "acetic acid", 1g of KNO_3 "Potassium nitrate", and 5g of Sodium acetate ($CH_3COONa.3H_2O$) (99%) mixed in the solution of 500mL of distilled water to make the solution for 1L.

II.   SolutionBuffer B: These mixtures are expected when SO_4^{-2} "pattern sulphate" is lower than 10mg/L). now mixed 30g of $MgCl_2.6H_2O$ "Magnesium chloride", 0.111g of Na_2SO_4 "sodium sulphate",1.0g of KNO_3 "potassium nitrate",5g of $CH_3COONa3H_2O$ "sodium acetate", and then we have to mixed a 20mL of acetic acid 99% in the distilled water solution of 0.50L to bring the solution up to 1L.

III.   Now mixed the $BaCl_2$ "Barium chloride" in the above solution.

IV.   Standard solution of the sulphate: In the distilled water of 0.1479g of dissolve Na_2SO_4 "anhydrous-sodium-sulphate" mixed 1L of this solution contains100 µg sulphate i. e. SO_4^{-2} or Diluted solution of 10.40mL mixed with 0.02N H_2SO_4 titrant designated in Alkalinity with distilled water of 1mL of solution which containing 100 µg of SO_4^{-2} to bring the solution up to 1000mL.

Sample collection, preservation and storage
Due to positive bacteria presence in organic matter may additionally reduce the SO_4^{-2} to S^{-2}. We have to store the samples at 4°C to keep away from this transition.

Procedure

I.   Consider the appropriate extent of the samples and diluted to 100mL into the Erlenmeyer flasks of 250mL

II.   Then we have to add buffer solution of 20mL, and then mixed properly

III.   Keeping the flask by continuous mixing with the help of stirrer. Then a continuous addition of one pigment of crystals $BaCl_2$. And this continues addition is only for 1minute to the solution.

IV.   Pour the solution into absorptionsmobile of photometer and then measure the turbidity of the solution at 5±0.5 minutes.

V.   To check the pattern turbidity and coloration, run a blank when the $BaCl_2$ is not added.

2.4 Phosphate (PO_4^{-3})

Apparatus and equipment
Colorimeter (Model Elico India) used generally at 690-880nm relay 0.50cm simple tube paths. 100mL, B. Nessler tube.
Reagents and standards

a.   Solution of the phosphate stock: in the solution of distilled water of dissolved anhydrous "KH_2PO_4" of 219.5mg and make the solution to 1L. However 1.0mLof solution includes 50.0mgof phosphate PO_4^{-3} as P.

b.   WorkingPhosphate solution: the inventory solution of 50mL diluted todistilled water of 1000mL. Since 1mLof solution carries 2.50mg PO_4^{-3} as P.

c.   Ammonium-molyb-date solution: the inventory solution of 25g of Dissolve ammonium-molyb-date in about 175mL of the distilled water. A continuous addition of conc. H_2SO_4 of quantity 280mL to the distilled water of 400mL. Add molyb-date after cool the solution to make the mixtures which is diluted to 1L.

d.   Strong acid reagent: By adding the conc. H_2SO_4 of quantity 300mL to the distilled water of 600mL. Now adding the conc. HNO_3 of quantity 4mL and cool the solution to make the mixtures which is diluted to 1L as P

e.   Sodium-hydroxide 6N: The dissolved NaOH of quantity 24g and diluted to 100mL.
f.   Use the Phenol-phthal-ein indicator
g.   Stannous-chloride reagent-I: Cleaned and dissolved $SnCl_2 . H_2O$ of quantity 2.5gm in the glycerol solution of 100mL. For ensuring the entire dissolution we have to heat on water tub.
h.   The diluted stannous-chloride reagents-II:Stannous-chlorides reagent-I of 8mL mixed properly with glycerol of 50mL.
i.   tartrate solution of Potassium-anti-monyl: Dissolved 2.69g of potassium antimonyl in the distilled water of 800mL and diluted to 1L.
j.   Ascorbic-acid: the dissolved ascorbic-acid of 1.76g in the distilled water of 100mL.
k.   **Combined reagent:** 250mL of 5N H_2SO_4, 150mL of ascorbic acid and75mL of ammonium molybdate solution. Finally add the solution of 25mL of potassium antimonyl tartrate and shake well.

Procedure

Ortho-phosphate: make the proper solution of the samples in the one hundred Nessler cylindrical tubes and precede this method for the strategy depicted with the instruction of the alignment bend. Due to the alignment bend, situate out the consideration of phosphate present in the example. Compute and explicit the outcome in milligram/litter of PO_4^{-3} as P.

Total-inorganic-phosphate or Total-Acid-Hydrolysable-Phosphate: make the proper solution of the sample in the cone like jar. Include 1drop of phenolphthalein marker. Include strong corrosive reagent until red hue vanishes. Include 1mL in additional at that point bubble for the five minutes and lower the temperature of the solution and discharge the solution through pipes if required. Now bring this solution to the cylindrical Nessler tube and mixed the solution with the sodium hydroxide. Then identify the significance of the solution at 690nm and 880nm. Then go for the study of comparing considerations from the alignment bend. However final outcome of the solution shows the aggregate of complete inorganic-phosphate that means the sum of the ortho-phosphates initially available to model solution. Therefore this may be stored or indicated the as complete inorganicphosphate. The amounts of acidichydrolysablephosphates are carried out by diminishing the ortho-phosphate existing in the authentic sample from the result.

2.5 Chloride(Cl^-)

Reagents and standards

Potassium chromate marker: the dissolved solution in the distilled water of 50g of $K_2Cr_2O_7$. We need to include $AgNO_3$ till exact purple precipitate is framed. Now keep the solution for 12 hours and then filter the solution to make the solution up to 1000mL in diluted form.

Silver nitrate (0.0141N): the dissolved solution of $AgNO_3$ which is about 2.395g and then make the solution up to 1000mL diluted. And then we have to standardise towards the $AgNO_3$ of 0.0141N $=$ 0.5mg of chlorides , NaCl (0.0141N).

Sodium chloride (0.0141N): the NaCl of 824.1mg which is a dissolved solution dried at around 40°C and then make the solution up to 1000mL; However 1mL=0.5mg of Cl^-.

Special reagents to push rotten and dirtiness: in the$AlK(SO_4)_2$ of weight 125g with $12H_2O$ or $AlNH_4(SO_4)_2$ of dissolved solutions. Then we have to mixed12H_2O in the solution to make the solution up to 1000mL. Now heated the solution up to 60^{0}C and then include 55mL conc. NH_4OH gradually. And then keep the solution for about 60 minutes. And then store the solution to quite large container and cleaned the precipitation by methods with proper combining and emptying the solution with distilled water till the solutions are not free from the chlorides.

Procedure

i.   Consider a 50mL nicely pattern by making the values of pH between 6.99-7.99 and finally adding the 1.0mL of $K_22Cr_2O_7$.

ii.   Titrates by preferred $AgNO_3$ answer until $AgCrO_4$ begins down as the yellow-purple precipitations

iii.   Standardised $AgNO_3$ towards the popular sodium-chlorides

iv.   50ml of titrate-distilled-water for higher accuracy in the equal ways for setting up the blank reagents.

v.   Usually 0.2-0.3mL of a blank is considerable.

Values Of Moisture-Content(Mc), Ph, EC, Total-Organic-Content, Total-Carbon-Content, TN, Sulphate, Phosphate , C/N Ratio , N/P Ratio, Calcium, Magnesium And Chlorides Solid Waste Sample Of Site III Mandideep Industrial Area On Phase II (October-December 2017)

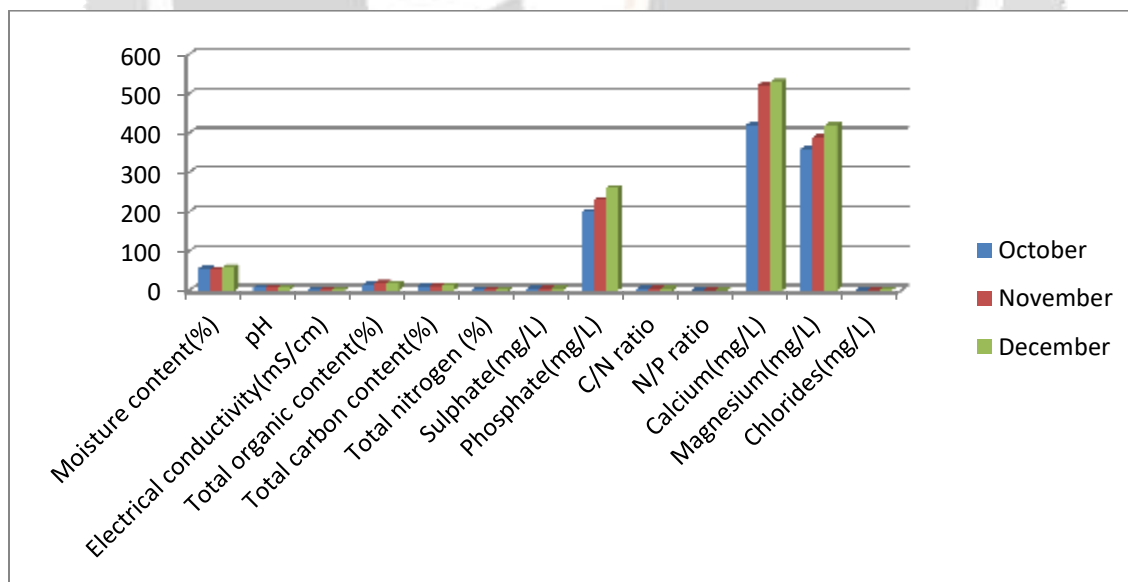| S.No.	Parameters	October	November	December
1	Moisture content(%)	56.00	53.00	59.00
2	pH	7.40	8.00	7.20
3	Electrical conductivity(mS/cm)	1.60	2.00	2.20
4	Total organic content(%)	15.00	19.00	18.00
5	Total carbon content(%)	10.30	11.30	13.20
6	Total nitrogen (%)	2.40	2.90	3.20
7	Sulphate(mg/L)	3.90	4.30	4.80
8	Phosphate(mg/L)	200.00	230.00	260.00
9	C/N ratio	4.29	3.90	4.13
10	N/P ratio	0.01	0.01	0.01
11	Calcium(mg/L)	420.00	522.00	530.00
12	Magnesium(mg/L)	360.00	390.00	420.00
13	Chlorides(mg/L)	0.90	1.20	2.00

Figure 2.1:Physico chemical Parameter of site III versus Phase II (October- December, 2017) of Mandideep Industrial area.

3. TOXIC compounds IDENTIFICATION in industrial waste

The environment pollution due to heavy metal has become a big problem at world level. During the recent year according to Benjamin and M.washat, et al., 2003; the heavy metals are toxic and non-bio-degradable to fauna and flora in the environment which is well explained by ltem, 2003, Ozturk, 2009 and krissana kriang kasi, 2003.

The seminars/activities has been made by anthropogenic namely energy consumption, practices in an agriculture, waste disposal methods and industrial activities increase due to release of heavy-metals in the high amounts to the ecosystem. Hence ensuing the consequential environmental pollutions due to the toxicity of the heavymetals. Now a day's heavymetals pollutions became a worldwide issues because of its wide spread distribution, sources, and the multiple effects on our ecosystem (Nriagu, 1990; Smith et al, 1994; wyszkowska and wyszkowska, 2007).

The above facts motivated as to take the present investigation of heavy metal toxicity as copper, cadmium, iron, lead and zinc in solid waste of Mandideep Industrial area.

3.1 Digestion of solid-wastes samples

The solid-wastes samples were dried at 50 °C and nicely ground at less than 2mm. after that we have to burnt the waste sample to ash which is crucible. The 0.5 grams of ashes of the solid waste were taken in to the conical flask, and then it is moistened with double distilled water of 2ml. Now add the concentrated HNO_3 and HCl in the ratio of 3:1 to above solution. Then the flask was gently heated until the sample was digested on the heating plate and was indicated by the formation of the clear solution. The solution was decreased to a volume of 1ml. In the final filtrate solution of 50ml, we have added the double distilled water and 42 number paper filter of filtrated whatman was used. The digested samples of 5 locations were analysed for heavy metal content using Perkin Elmer Atomic Absorption Spectrophotometer analyst 400.

Values of Copper, Cu, (Mg/Kg) Concentration In Solid Samples of 5 locations (Site-I, Site-II, Site-III, Site-IV And Site-V) Of Mandideep Industrial Area On Phase II (October -November, 2017)

S. No.	LOCATIONS	OCTOBER	NOVEMBER	DECEMBER
1	Site I	90.50	93.80	102.80
2	Site II	324.00	337.00	340.70
3	Site III	119.70	123.00	132.00
4	Site IV	99.70	103.00	112.00
5	Site V	74.00	87.00	90.70

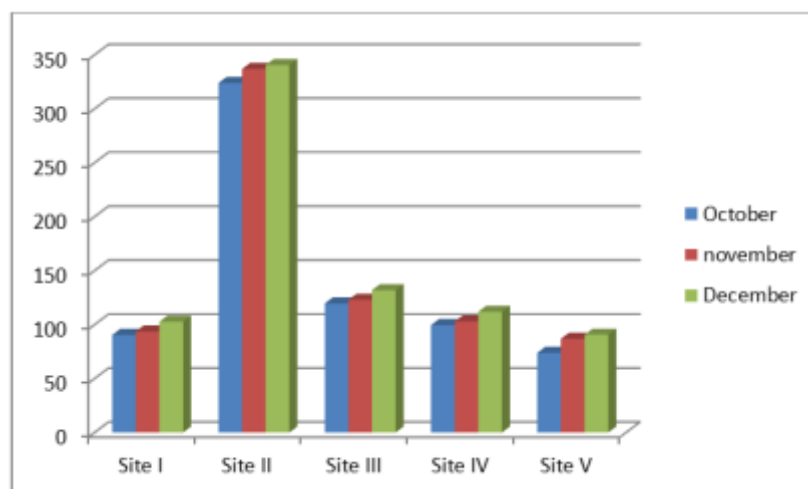Figure 3.1: The copper, Cu (mg/Kg) content of 5 locations versus phase-II(October-November, 2017) of Mandideep Industrial area.

4. Result and discussion

The managements of Solid waste are probably the most essential in the house-keeping services required by the city and urban habitants to maintain their quality of life. This service in the rural areas lags behind in India, but leading to some lawlessness in the urban sector. The organizational weaknesses, improper technology, shortages of financial and human resources, inappropriate collections, insufficient distribution, transportations, disposals as well as the overall improper planning are considered as the more generalized wastes management's weakness in most of the cities in India. This has a big embarrassment to health of the local peoples, municipal workers as well as staffs, industrial workers as well as the climates of the urban areas.

Solid waste management's programs are driven by a desire to clean environments in the hope of promoting sound environments quality and public health. For best solid waste management program, complete understanding of physico-chemical parameter and toxic compounds of solid waste is required, which in turn will govern their behavior in the environments.

All the data are shown in table below

Phase I					
Parameters	Site I	Site II	Site III	Site IV	Site IV
Moisture content(%)	57.33	61.67	62.00	60.33	61.33
pH	7.87	7.47	7.47	7.60	7.51
Electrical conductivity(mS/cm)	4.20	3.83	1.87	3.30	3.00
Total organic content(%)	17.67	23.33	15.33	18.78	19.15
Total carbon content(%)	9.43	11.80	10.40	10.54	10.91
Total nitrogen (%)	1.20	3.80	2.63	2.54	2.99
Sulphate(mg/L)	3.17	7.87	3.70	4.91	5.49
Phosphorus(mg/L)	238.33	570.00	206.67	338.33	371.67
C/N ratio	8.07	3.11	4.01	5.06	4.06
N/P ratio	0.50	0.01	0.01	0.17	0.06
Calcium(mg/L)	180.00	330.00	470.00	326.67	375.56
Magnesium(mg/L)	76.67	156.67	356.67	196.67	236.67
Chorides(mg/L)	19.33	63.33	113.33	65.33	80.67

Phase II					
parameters	Site I	Site II	Site III	Site IV	Site IV
Moisture content(%)	52.00	52.67	56.00	53.56	54.07
pH	7.60	6.90	7.53	7.34	7.26
Electrical conductivity(mS/cm)	4.90	4.83	1.93	3.89	3.55
Total organic content(%)	24.00	29.00	17.33	23.44	23.26
Total carbon content(%)	12.13	13.80	11.60	12.51	12.64
Total nitrogen (%)	1.93	4.77	2.83	3.18	3.59
Sulphate(mg/L)	3.70	8.40	4.33	5.48	6.07
Phosphorus(mg/L)	342.00	680.00	230.00	417.33	442.44
C/N ratio	6.29	2.89	4.10	4.43	3.81
N/P ratio	0.01	0.01	0.01	0.01	0.01
Calcium(mg/L)	289.00	453.33	490.67	411.00	451.67
Magnesium(mg/L)	182.67	250.00	390.00	274.22	304.74
Chorides(mg/L)	50.33	73.33	136.67	86.78	98.93

Phase III

parameters	Site I	Site II	Site III	Site IV	Site IV
Moisture content(%)	45.33	42.00	47.67	45.00	44.89
pH	6.87	6.83	7.00	6.90	6.91
Electrical conductivity(mS/cm)	5.77	5.50	2.03	4.43	3.99
Total organic content(%)	28.00	36.33	20.33	28.22	28.30
Total carbon content(%)	15.50	21.00	12.07	16.19	16.42
Total nitrogen (%)	3.40	5.63	3.63	4.22	4.50
Sulphate(mg/L)	4.50	8.60	4.93	6.01	6.51
Phosphorus(mg/L)	399.33	776.67	301.00	492.33	523.33
C/N ratio	4.59	3.72	3.31	3.87	3.63
N/P ratio	0.01	0.01	0.01	0.01	0.01
Calcium(mg/L)	296.67	553.33	548.00	466.00	522.44
Magnesium(mg/L)	248.33	266.67	446.67	320.56	344.63
Chorides(mg/L)	58.67	113.33	166.67	112.89	130.96

Phase IV

parameters	Site I	Site II	Site III	Site IV	Site IV
Moisture content(%)	38.67	36.00	38.00	37.56	37.19
pH	6.77	6.40	6.80	6.66	6.62
Electrical conductivity(mS/cm)	6.40	6.77	2.53	5.23	4.84
Total organic content(%)	34.00	42.00	27.33	34.44	34.59
Total carbon content(%)	28.00	27.33	12.73	22.69	20.92
Total nitrogen (%)	4.60	6.73	3.93	5.09	5.25
Sulphate(mg/L)	4.90	10.23	5.57	6.90	7.57
Phosphorus(mg/L)	411.33	817.00	390.00	539.44	582.15
C/N ratio	6.07	4.04	3.24	4.45	3.91
N/P ratio	0.01	0.01	0.01	0.01	0.01
Calcium(mg/L)	325.67	571.00	568.67	488.44	542.70
Magnesium(mg/L)	265.00	325.33	460.67	350.33	378.78
Chorides(mg/L)	67.00	140.00	256.67	154.56	183.74

Phase I (July - September, 2017)

The average moisture contents (%) of solid waste samples ranged from 57.33 to 62.0%. The average pH value of the solid waste samples varies from 7.47 to 7.87. The average electrical conductivity of solid waste samples was found to be in range of 1.87 to 4.20mS/cm.The average estimated values of total organic content of the samples of solid waste are varies between the 15.33 to 23.33%. Average total carbon content is observed in the range between 9.43 to 11.80%. The average total nitrogen content value of the samples was measured between 1.20 to 3.8%.The average sulphate values was found to be range of 3.17 to 7.87 mg/L. The average phosphate values were observed in the range between 206.67to 570.0 mg/L. The average C/N ratio were found in the ranged between 3.11 to 8.70.The average calcium values of solid waste samples were varies from 180 to 470mg/L. The average values of magnesium were found in the range between 76.67 to 356.37mg/L. The average observed value of chloride is solid waste were ranged from 19.33 to 113.33mg/L.

Phase II (October - December, 2017)

The average moisture content(%) of solid waste samples varies from 52 to 56%. The average pH valves were all in the range of 6.90 to 7.60. The average Electrical conductivity of solid waste samples ranged from 1.93 to 4.90mS/cm. The average total organic content values are in the range of 17.33 to 29.00%. The average estimated values of total carbon values are in the range between 11.60 to 13.80%. The average total nitrogen content values are observed was ranged from 1.93 to 4.77%. The average sulphate values of solid waste vary from 3.70 to 8.40mg/L. Average Phosphorus contents were calculated between 230.00 to 680mg/L. The C/N ratio is varied from 2.89 to 6.29. The average values of calcium found in solid waste are ranged from 289.0 to 490.67 mg/L). The average magnesium values observed in solid varies from 182.67 to 390.0mg/L. The average estimated contents of chlorides present in the solid waste were ranged between 50.33 to 136.67mg/L.

Phase III. (January – March, 2018)

The average moisture content (%) of solid waste ranged from 42.00 to 47.67%. The average pH of the waste sample were varies from 6.87 to 7.00. The average values of electrical conductivity of samples were found to be in range of 2.03 to 5.77mS/cm. The average estimated values of total organic content of the samples are lies between 20.33 to 28.30%. Average total carbon content values of sample are lies between 12.07 to 21.00%. The average total nitrogen content value of the samples was measured between 3.40 to 5.63%. The average sulphate values of samples were found to be range of 4:50 to 8.60mg/L. The average Phosphorus values were observed in the range between 301.00 to 776.67 mg/L. The average C/N ratio were found in the ranged between 3.31 to 4.59.The average calcium values of solid samples Varies from 296.67 to 553.33 mg/L. The average values of magnesium were found in the range between 248.33 to 446.67mg/L. The average observed values of chloride in solid waste were ranged from 58.67to 166.67mg/L.

Phase IV (April – June, 2018)

The average moisture content of solid waste samples varies from 36.00 to 38.67. The average pH values were able to the range of 6.40 to 6.80. The average electrical conductivity of solid waste samples, ranged from 2.53 to 6.77mS/cm. The average total organic content values are in the range of 27.33 to 42.00 %. The average estimated values of total carbon are in the range between 12.73 to 28.00%.

The average total nitrogen content values are observed was ranged from 3.93 to 6.73%. The average sulphate value of solid waste varies from 4.90 to 10.23 mg/L. The average value of Phosphorus has been measured and varies between the 390.00 to 817.00 mg/L. The average values of C/N ratios are varied from 3.24 to 6.07. The average values of calcium found in solid waste are ranged from 325.67to 571.00mg/L. The average Magnesium values observed in solid varies from 265.00to 460.67mg/L. The value of average estimated chloride present solid wastes varies between 67.00 to 256.67 mg/L.

5. Conclusion

The information based on the nature of solid wastes i.e. its composition, physical as well as its chemical characteristics and generated quantities are basic needs for the solid wastes managements planning. The analysis of the characteristics, composition and the quantities of waste is even more essential because they provides the basic data for planning the management system, design and operation, the changes and tendency in composition of solid waste over a time period are known which will greatly help in the future planning and prognosis of trend assists the designers and manufactures in the production of equipment and vehicles suitable for the future needs. The examination of characteristics and composition of solid wastes in the different parts of the Mandideep underscores the deeply influence of the income, social development, socioeconomic conditions and cultural practices and hence we have focused more attention on the importance of obtaining the data locally.

The results analysis for chemical and physical properties such as (average moisture contents (%), average pH(Potentio Hydrogenie), average electrical conductivity, average total-organic-content(TOC), average total-carbon-content(TCC), average total-nitrogen(TN), average sulphate, average phosphate, average C/N ratio, averageN/P ratio, average calcium and magnesium and average chloride) of 5 locations(site-I, site-II, site-III, site-IV and site-V) during the phase-I (July-September, 2017), phase-II (October -December, 2017), phase-III (January-March, 2018) and phase-IV(April-June, 2018)of Mandideep industrial area, Bhopal, Madhya Pradesh are listed in Table6.1 to Table 6.13.The plots of physico-chemical investigation in solid waste samples of 5 locations during the period July2017-June 2018 of Mandideep industrial, area M.P. are presented in the Figure of chapter 6.

6.   Future aspects of Analysis

In present investigation the results of physico-chemical investigation and toxic compounds identification of industrial solid waste samples of 5 locations(site-I,site-II,site-III,site-IV and site-V) during the phase-I(July-September, 2017), phase-II(October-December, 2017), phase-III(January-March, 2018) and phase-IV(April-June, 2018) of Mandideep industrial area, Bhopal, Madhya Pradesh are extremely high.

Solid waste samples of Mandideep area consists of toxic compounds like Zn, Pb, Fe, Cd, Cr, Cu and As contents in high concentration which persists more in the environment due to this reason the special attention and to deal with the scientific planed solid waste strategies. Therefore it may prove as resources instead of wastes are given below.

The managements of the solid waste needed few hours for gravely dealt with public and govt. bodies to give solid waste management services properly to the peoples. The public disinterest and low social status prescribed for activities made by the solid waste management by the public bodies are a big hamper during the problem solving. It must followed the stringent laws in this manner such that the disposals and treatments of solid wastes should be proper. There will be no new plans for any industrial area, commercial area and residential area should be passed till there is no proper place for the disposals as well as treatments of its wastes. The participation of the publics and privates sector in India are more strong. And this can be seen efficiently in Mandideep industrial area, Bhopal, Madhya Pradesh. However the private sectors are coming with its capitals, technologies, expertise, every time improvements and efficiently managed services. The participation of the public is of high-priority weightage and they can produce the highest results if properly being looked. The Indian govt. bodies like NSWAI is working very efficiently to solve the allied problems with the help of SWM in India and that has given the beautiful model presented in the Figure6.1.

Figure6.1 Sustainability model by NSWAI

On the model based on NSWAI model the following different proposals that develop to improve the current strong industrial waste practices in study region:

(1) Community participation in solid waste management is the key to sustain a project related to management of solid waste. Till date no such tax has been levied for solid waste.

(2) The people should be educated to realize the importance of source segregation at generation point as biodegradables, inert and recyclable material for proper waste management.

 (3) Viable decentralized composting plants should be installed to reduce the load on urban local bodies for collection and transportation of solid waste, which subsequently culminates in reduction of the pressure exerted on the landfills.

(4) For Industrial area, zone-wise decentralized composting units should be setup. Through community participation, segregated biodegradable waste from individual community/units should be collected and disposed into these decentralized composting units.

(5) Characterization of solid waste at collection and also at disposal point should be made and be available in public domain. Government should take initiative to encourage Universities, technical Institution to take up waste management in its curriculum. Assistance of academic institutions should be solicited in characterization of waste in their vicinity. Thereby most part of India would be covered and location-specific appropriate solutions for waste management can be developed. It can also help to select suitable waste-to-energy technologies for particular regions.

(6) The solid waste should be treated as resource and formal recycling sector/industries be developed to recycle non-biodegradable recyclable component from the waste thereby providing employment to rag-pickers and absorb them in mainstream. Also a policy, fiscal intensive and development of quality standard for reuse and recycle of solid waste be developed and notified so that producers dispose/reuse it as per guidelines, thereby reducing burden on landfill.

(7) Manufacturing of non-recyclable polyethylene bags should be banned or research should be initiated to develop biodegradable polyethylene.

(8) The practices of leachate/liquid recirculation in landfill should be encouraged to enhance waste stabilization and gas recovery as practiced. Modification and provision for it should be made in Municipal Solid Waste (Management and Handling) Rules, 2000 accordingly.

(10) Protection of groundwater contamination from leachate percolation from open dump/landfill site should be made compulsory. Appropriate technological solution should be adopted to achieve this goal.

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