
DETECTION OF ORGANIC MOIETIES FROM AN INDUSTRIAL EFFLUENT OF TEXTILE PRINTING INDUSTRY LOCATED IN UDHANA (SURAT), GUJARAT: A CASE STUDY

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Abstract : Industrial effluent from Gujarat State Industrial Development Corporation, Udhana industrial area was collected for analyzing different organic fractions present in it and their impacts on life of human and other living organisms. Collected sample was extracted using dichloromethane. The extracted organics were characterized by HR-LCMS and FTIR. Saturated and unsaturated hydrocarbons, alcohols, ketones, aldehydes and nitrates were observed in the analyzed sample.

Key words : Organic moieties, Detection, FTIR, LC-MS.

Introduction :

As industrial development took place in the beginning of nineteenth century in western world and reached in second half of twentieth century in eastern countries. In this course of industrialization different types of industrial projects were established in various regions of our country. Every industrial unit uses natural resources of the location and releases certain waste materials like ash, smoke, solid waste material, drain water etc which are formed during manufacturing process (1,2). In chemical and textile industries water is used on large amount and after the process is completed the wastewater is released in the form of effluent. This discharged effluent contains many harmful contaminants which pollutes natural water resources like rivers, ponds and lakes (3-5). Effluent discharged from textile industry causes serious environmental threats due to its high contamination of color and organic matter. When this fact was pointed out the process of effluent treatment was made compulsory for every effluent discharging unit by the pollution controlling board of Government. Many kinds of industries like textiles, dyeing and printing, agrochemicals and pesticides, paper mills, food processing plants, tanneries are responsible for all types of environmental pollutions viz

air pollution, water pollution and land pollution (6-8). The waste water contains major contribution to color in textile wastewater was usually dyeing and washing operations after dyeing, during which as much as the dye was released into effluent (9-12). Due to stability of modern dyes severe pollution was caused by dye industries. Though most of the industries taking care, to control environmental pollution those are not sufficient to reduce it (13-16). The organic dyes observed in the wastewater are found to be carcinogenic and mutagenic (17). Day by day population on the earth increases rapidly. Thus to fulfill the increasing demand of population, industrialization also increases rapidly, which results into pollution. Water born diseases arising from the contaminated water killed several millions peoples in developing countries. Due to increasing industrialization developing countries become major victims of the environmental pollution (18). As society is progressing day by day the demands of such society are increasing further. These increased demands forces industry to bring new improved varieties goods in market. The manufacturing processes of such goods involve further addition of environmental hazardous pollutants in all natural resources. And which is continuously increasing without any break. Thus to fulfill the increasing demand of increasing

population industrialization increases rapidly, which results into pollution. Water born diseases arising from the contaminated water killed several millions peoples in developing countries (19). Due to increasing industrialization developing countries become major victims of the environmental pollution

Materials and Method :

Industrial effluent samples of dyeing and printing industry were collected from Udhana, Surat (Gujarat). The organic from the samples were extracted by using dichloromethane at nonmaterial research laboratory Kisan College, Parola Dist ;Jalgaon. The extracted content of organic material were further concentrated to small volume and analyzed by using FTIR and HR-LCMS at Sophisticated Analytical Instrument Facility, IIT Bombay, Powai, Mumbai-400 076

Result and discussion :

HR-LCMS spectra of dichloromethane extracted sample are shown in fig. 1 to 5 and Extracted organics detected using HR-LCMS are reported in Table 1. The FTIR spectra of sample are shown in fig.6 the observed FTIR frequencies along with the functional groups are reported in Table 2. It is found that saturated and unsaturated hydrocarbons, alcohols, ketones, alkyl halides are present in the industrial effluent samples. These organic compounds are converted into stable compounds by Complexation with the different metal ions present into soil and ground water sources. Makes the ground water unfit for domestic use as well as for drinking purpose. These organic compounds have adverse effect on the ground water quality. Thus this contaminated ground water is unsuitable for all living organisms. Compounds detected from the industrial effluent samples have toxic effects.

Table - 1 : Organics detected from industrial wastewater sample by LCMS technique.

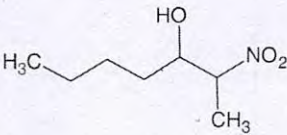
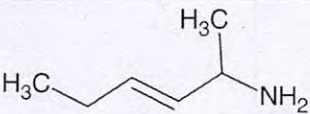
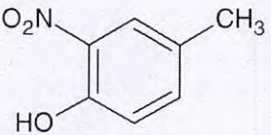
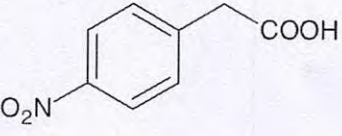
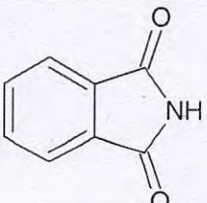
Sr. No.	Name of the compound	Structure of the compound
1.	2-nitroheptan-3-ol	
2.	Hex-3-en-2-amine	
3.	4-methyl-2-nitrophenol	
4.	(4-nitrophenyl)acetic acid	
5.	Phthalimide	

Table - 2 : Interpretation of functional groups from FTIR.

Sr. No.	Frequencies cm^{-1}	Interpretation
1.	3750	O-H stretching
2.	3432	N-H stretching
3.	2920	C-H stretching
4.	1634	O = C-NH stretching cyclic
5.	1565	C = C stretching / NO_2 stretching
6.	1423	C-N or C-H bending in $-\text{CH}_2$
7.	675	NO_2 bending

MFE MS Zoomed Spectrum

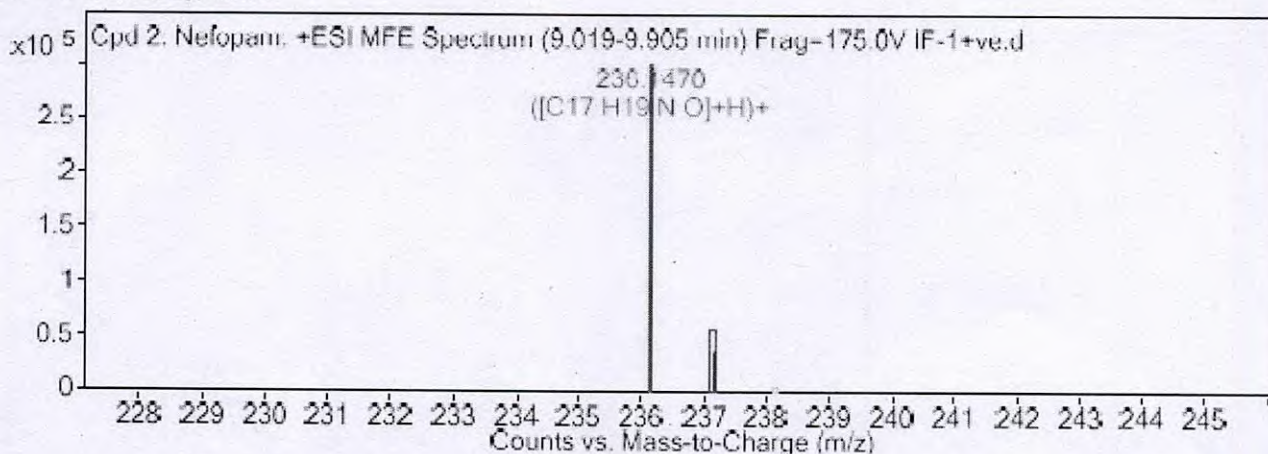


Fig. - 1 : HR-LCMS for different fractions in sample

MFE MS Spectrum

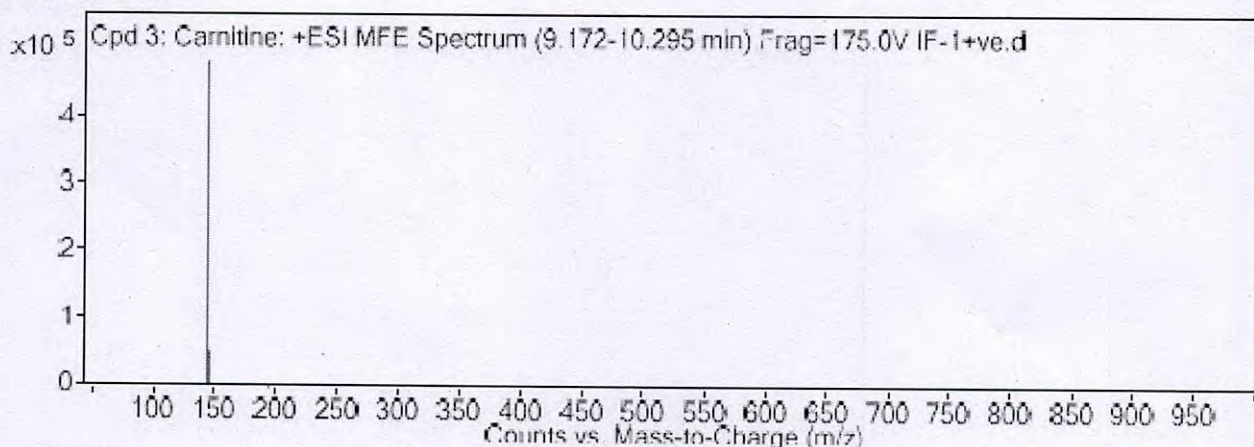


Fig. - 2 : HR-LCMS for different fractions in sample

MFE MS Zoomed Spectrum

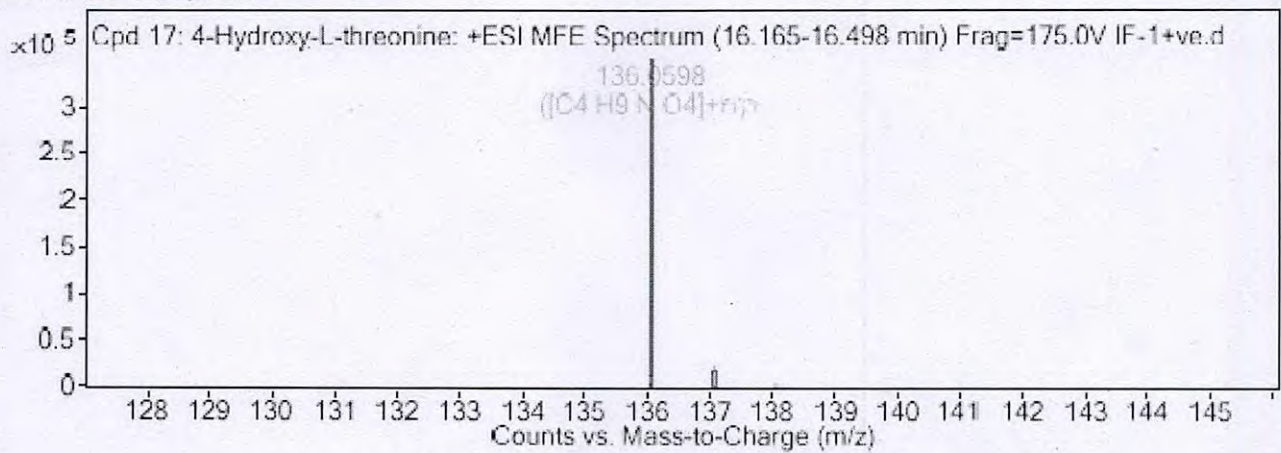


Fig. - 3 : HR-LCMS for different fractions in sample

MFE MS Spectrum

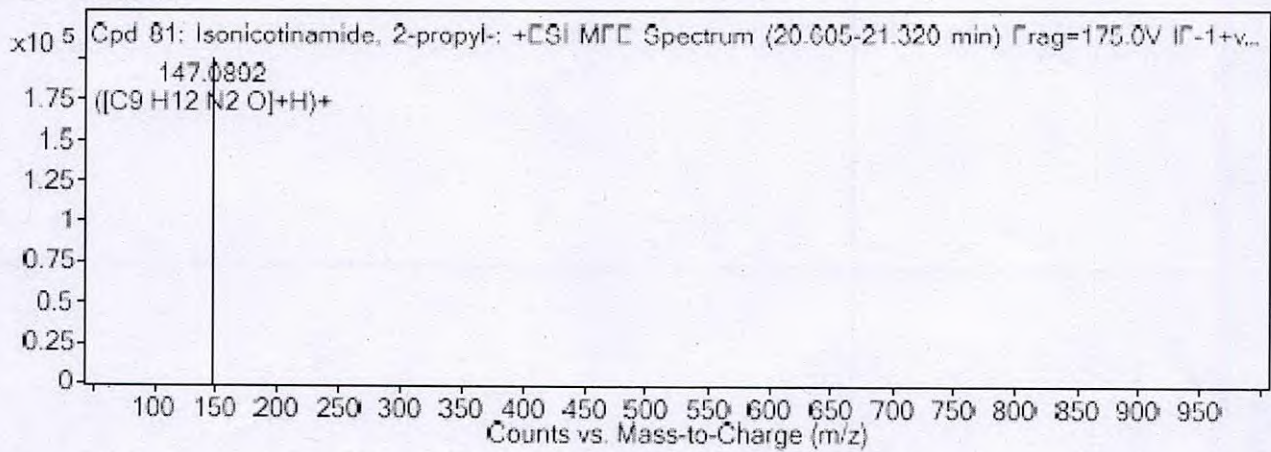


Fig. - 4 : HR-LCMS for different fractions in sample

MFE MS Zoomed Spectrum

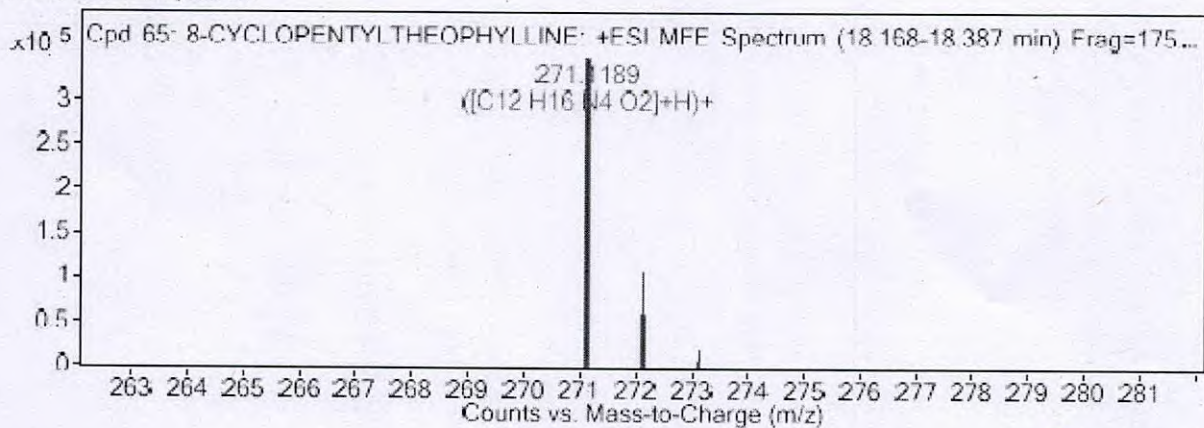


Fig. - 5 : HR-LCMS for different fractions in sample

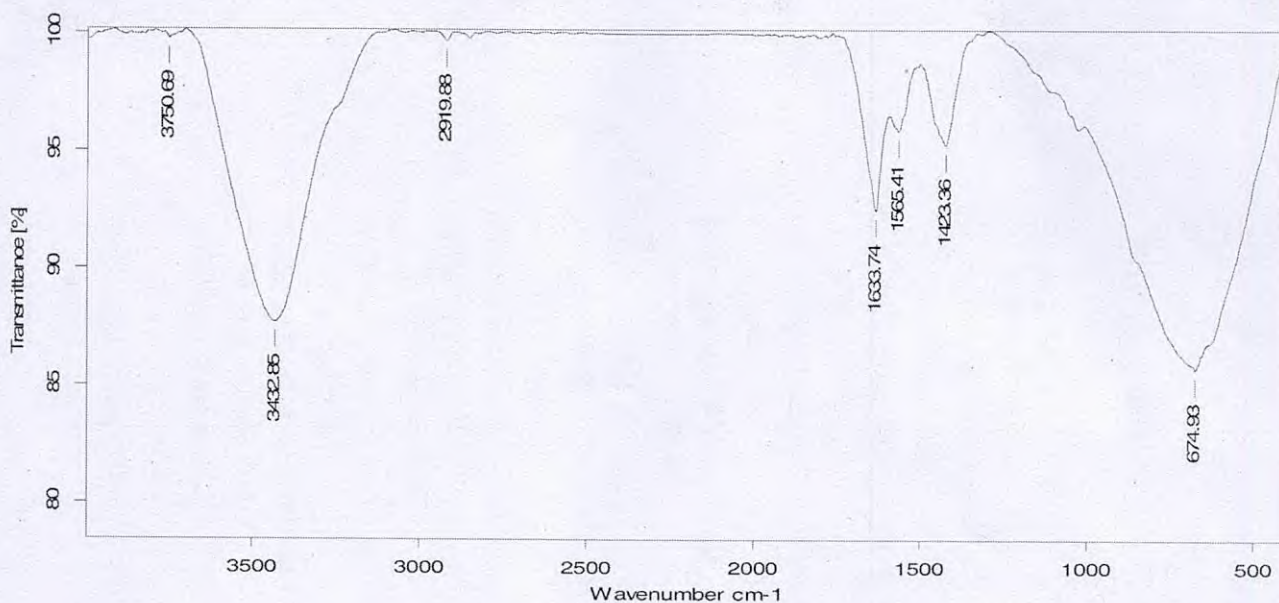


Fig. - 6 : FTIR spectra of sample

Phthalimide derivatives can cause diarrhea, vomiting, weakness and depression of central nervous system. 2-nitroheptan-3 ol is moderately toxic, acts as skin and eye irritant also decreases heart rate. Most of the compounds are acts as irritant for skin, eye respiratory tract and digestive tract .

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References :

- 1] Lagona, A., Bacaloni, A., De, Leva, Fabori G. and Marina, A., Analytical methodologies for determining the occurrence of endocrine disrupting chemicals in sewage treatment plants and natural water, *Analytica Chimica Acta*, **501**, 79-88 (2004).
- 2] Goyal, P.K., Water pollution, New Age International Publication, **2**, 139-145 (2007).
- 3] Sahu, A.K., Pandey, A.B. and Salam, R., Water quality assessment of Dikrong river and Nirjuli stream India, *Pollution Research*, **25** (2), 333-335 (2006).
- 4] Batheja, K., Sinha, A.K. and Seth, G., Nitrate and fluoride contaminations in ground water of Churu Block Rajasthan, *J of Indian Water Works Association*, **40**(1), 45-49 (2008).
- 5] Naik, S.O. and Choukmath A., Effective management of textile effluents-man made textile of India, *Journal of Aqua Biology* **15** (1), 443-445 (2002).
- 6] Bidwell, V. J. Decision Support for protecting ground water from land treatment of waste water, *Environ Metrics*, **11**, 553-562 (2000).
- 7] Saupe, G. B., Zhao, Y., Bang, J., Yesu, N.R., Carballo, G.A., Ordonez, R. and Bubphamala, T., Evaluation of a new porous titanium-niobium mixed oxide for photocatalytic water decontamination *Microchemical Journal*, **81**, 156-162 (2005).
- 8] Sonawane, G.H. and Shrivastava, V.S., Kinetics of decolourization of malachite green from aqueous medium by maize cob (Zea maize): An agricultural solid waste, *Desalination*, **251**, 1-12 (2009).
- 9] Nandre, C.V. and Shrivastava, V.S., Solvent

extraction, detection and identification of organics in wastewater by FTIR and GC-MS techniques, Asian Journal of Chemical and Environmental Research, **4(2)**, 67-72 (2011).

Surat region (Gujarat) Asian Journal of Chemical and Environmental Research, **6(1-2)** (2013).

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- 10] Patil, B.N., Josi K.M. and Shrivastava, V.S., Organics by GC-MS, Asian Journal of Chemical and Environmental Research, **3(3)**, 53-55 (2010).
- 11] Neamtu, M., Sim Iniceanu, F. and Yediler, A., Dyes and Pigments, **53**, 93-99 (2002).
- 12] Manju., Chaudhari, Ashu and Dinesh Kumar, Evaluation and reduction of colour from dyeing and printing industrial effluents of sangner, Jaipur city, Asian Journal of Chemical and Environmental Research, **3(1)**, 26-28 (2010).
- 13] Ali Shareef, Rai Kookana, and Mike Williams, Detection of contaminants of emerging concern in domestic wastewater from urban sources, CSIRO (2010).
- 14] Yeole, P.M. and Shrivastava, V.S., Detection of organics and trace metals by FTIR, GC/MS and ICP-AES and their organic-metallic statistics, Journal of Applicable Chemistry, **1(3)**, 397-405 (2012).
- 15] Mahajan, S.V. and Shrivastava, V.S., Detection of organics by FTIR & GC-MS Asian Journal of Chemistry, **17(2)**, 907-912 (2005).
- 16] Sonawane, G.H. and Shrivastava, V. S., Organic-Metallic Interactions in Dye Industry Waste Water: A Statistical Approach, Asian J. of Chemistry, **19(5)**, 3637-3644 (2007).
- 17] Robinson, T., Chandran, B. and Nigam, P., Removal of dyes from synthetic textile dye effluent by biosorption on apple pomace and wheat straw, Water Research, **36(11)**, 283-284 (2002).
- 18] Shrivastava, V.S., Degradation of Methylene blue by using CdS thin films, Asian J. of Chemical and Environmental Res., **4(2)**, 76-78 (2011).
- 19] Sandip Patil, G.H. Sonawane and V.S. Shrivastava, Detection of Organics from Industrial effluents of