African Journal of Pure and Applied Chemistry Vol. 3 (9), pp. 165-169, September, 2009
Available online at http://www.academicjournals.org/AJPAC
ISSN 1996 - 0840 © 2009 Academic Journals

Full Length Research Paper

Determination of anions by ion chromatography in water samples of Baghdad city

Hassan M. L. Alsudani*, Redha I. Al-Bayati and Mahmood M. Barbooti

Department Chemistry, College of Science-Almustansiriya University-Baghdad- Iraq.

Accepted 28 May, 2009

Determinations of common anions by IC methods in Baghdad were carried out in this investigation. The optimum values of the instrumental parameters were reached best in relative standard deviation (RSD), correlation coefficient (r^2) and method detection limits (MDLs) and other parameters to proving the precision and accuracy of this method. Both peak height (PH) and peak area (PA) were used for the evaluation of the IC signals. All standards and samples have been prepared by ultra pure water. Generally the peaks for anions were clearly, good resolution and there are no any interaction between its. We recorded the total time for anion analyses was about 14 min.

Key words: Ion chromatography, common anions, water samples.

INTRODUCTION

A whole variety of chemicals from industry, such as metals and solvents and even chemicals which are formed from the breakdown of natural wastes (ammonia, for instance) are poisonous to fish and other aquatic life. Pesticides used in agriculture and weeds are another type of toxic chemical. Some of these can accumulate in fish and shellfish and poison people, animals, and birds that eat them. Materials like detergents and oils float and spoil the appearance of a water body, as well as being toxic; and many chemical pollutants have unpleasant odors. The Niagara River, between the US and Canada, even caught fire at one time because of flammable chemical wastes discharged into the water (Koller et al., 2000; Ainsworth, 2004).

Chemicals can enter water ways from a point source or a non point source. Point source pollution is due to discharges from a single source, such as an industrial site. Non point-source pollution involves many small sources that combine to cause significant pollution. For instance, the movement of rain or irrigation water over land picks up pollutants such as fertilizers, herbicides, and insecticides and carries them into rivers, lakes, reservoirs, coastal waters, or groundwater. Another non point source is storm water that collects on roads and eventually reaches rivers or Paper and pulp mills solid waste products into the environment. The liquid waste is usually high in biological oxygen demand, suspended solids, and chlorinated organic compounds such as dioxins (Doust et al., 1994; Abid and Jamil, 2005).

The storage and transport of the resulting solid waste (wastewater treatment sludge, lime sludge, and ash) may also contaminate surface waters. Sugar mills are associated with effluent characterized by biological oxygen demand and suspended solids, and the effluent is high in ammonium content. In addition, the sugarcane rinse liquid may contain pesticide residues. Leather tanneries produce a significant amount of solid waste, including hide, hair and sludge. The wastewater contains chromium, acids, sulfides, and chlorides. Textile and dye industries emit a liquid effluent that contains toxic residues from the cleaning of equipment. Waste from petrochemical manufacturing plants contains suspended solids, oils and grease, phenols, and benzene. Solid waste generated by petrochemical processes contains spent caustic and other hazardous chemicals implicated in cancer (WHO, 2004).

Some pesticides are applied directly on soil to kill pests in the soil or on the ground. This practice can create seepage to groundwater or runoff to surface waters. Some pesticides are applied to plants by spraying from a distance even from airplanes. This practice can create spray drift when the wind carries the materials to nearby waterways. Efforts to reduce the use of the most toxic and long-lasting pesticides in industrial countries have largely been successful, but the rules for their use in developing countries may be more permissive, and the rules of

*Corresponding author. E-mail: Hassan_nsr2001@Yahoo.com.

Table 1. Various types of water collected from various studied location in Baghdad city.

Location	No. of samples	Type of water	No.
Tigris east plant	22	Raw water (RWT)	1
Tigris east plant	22	Drinking water (DWT)	2
Wathba plant	22	Raw water (RWW)	3
Wathba plant	22	Drinking water (DWW)	4

application may not be known or enforced. Hence, health risks from pesticide water pollution are higher in such countries (Ahmed and Ali, 2000).

Chromatography is a separation method based on the affinity difference between two phases, the stationary and mobile phases. A sample is injected into a column, either packed or coated with the stationary phase, and separated by the mobile phase based on the difference in interaction (distribution or adsorption) between compounds and the stationary phase. Compounds with a low affinity for the stationary phase move more quickly through the column and elute earlier. The compounds that elute from the end of the column are determined by a suitable detector. In ion chromatography, an ion exchanger is used as the stationary phase, and the eluant for determination of anions is typically a dilute solution of sodium hydrogen carbonate and sodium carbonate. Colorimetric, electrometric or titrimetric detectors can be used for determining individual anions. In suppressed ion chromatography, anions are converted to their highly conductive acid forms; in the carbonate bicarbonate eluant, anions are converted to weakly conductive carbonic acid. The separated acid forms are measured by conductivity and identified on the basis of retention time as compared with their standards (Omar, 2000; Kahlownet al., 2004).

The study of chemical pollutants in various types of water in Baghdad city were found necessary in order to investigate all of surrounding factors affecting on water pollution.

So, the present study aimed to establishment of ion chromatographic method for drinking and raw water quality monitoring.

EXPERIMENTAL DESIGN

Sampling

Water samples were collected from various locations (Table 1) from August and September (2008).

HPIC Measurements

The HPIC measurements were carried out on a Compact high-performance ion chromatography, 761 Compact IC system supplied from Metrohm, Switzerland, (P.N. 6.2620.110). The system is connected to a PC-controller; Rapid start – click and analog output for connection to external data systems with or without chemical suppression.

For automation tasks, the system is equipped with 766 IC Sample Processor, the 788 IC Filtration Sample Processor, the 788 IC Dialysis Sample Processor and the 813 Compact IC Autosampler (Order number 2.813.0010).

The Metrohm 761 Compact IC system is characterized by:

- Built-in 6-way injection valve;
- Low-pulsation double piston pump, flow range 0.2 to 2.5 ml/min, maximum pressure 25 MPa (250 bar, 3625 PSI);
- Pulsation dampener;
- Insulated column compartment;
- Detector temperature-stabilized to better than 0.01°C, temperature range 25 ... 45°C in 5°C steps, three measuring ranges 0 ... 50 µS, 0 ... 250 µS, 0 ... 1000 µS

RESULTS AND DISCUSSION

The Figures (1 - 4) illustrated the results of anion determine by IC technique in various studied locations as shown in Table (1).

Fluoride

The average of fluoride concentration determine by IC in various locations of August and September (2008) was as follow:

0.166 mg/L for each of RWET, DWET, RWW, and DWW
0.4 mg/L for TWK
0.035 mg/L for RWK
0.075 mg/L for DWK

There are a constant average of fluoride value in RWET, DWET, RWW, and DWW, and unaffected with water treatment. Also all these values are within the standard limitation

Chloride

The concentration average of chloride determines by IC in various locations of August and September, 2008 was as follow:

RWET: 91.5 mg/L
DWET: 96.5 mg/L
RWW: 116 mg/L
DWW: 123 mg/L

According to our results, we conclude that water after treatment (DW) was highly than that before treatment (RW), that’s because, addition of chlorine through water

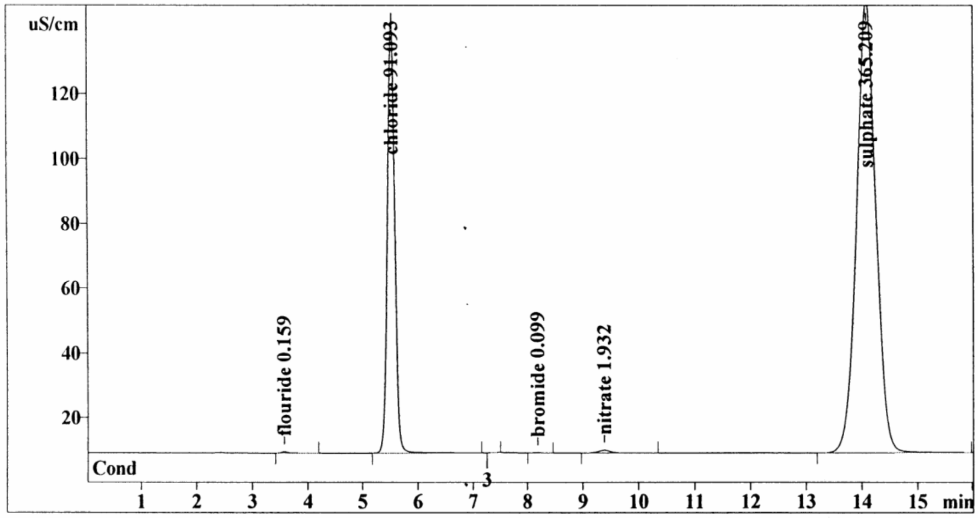

Figure 1. Chromatogram of common anions in raw water sample for East Tigris Plant.

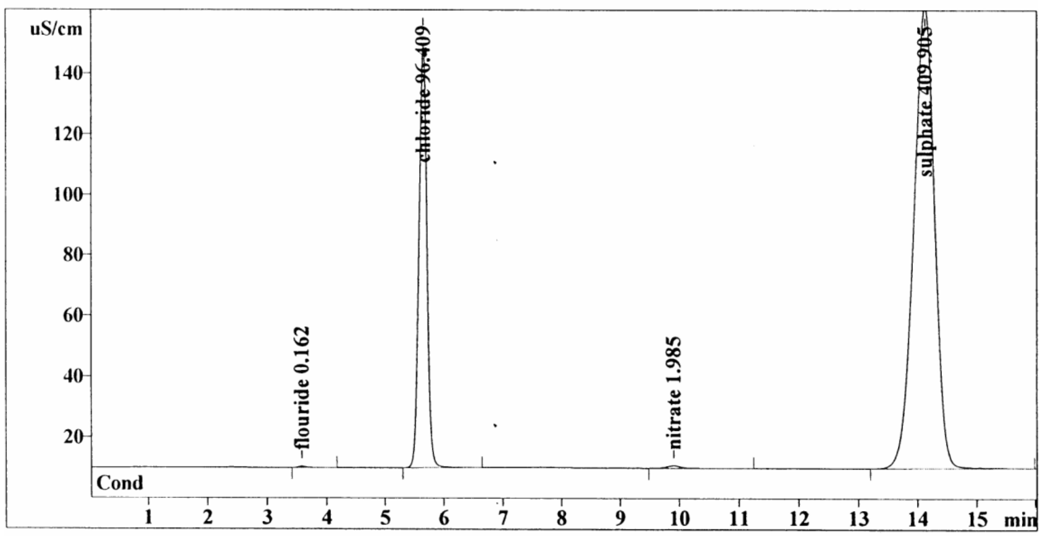

Figure 2. Chromatogram of common anions in drinking water sample for east Tigris plant.

treatment. And chloride concentrations were always in Wathba plant highly than East Tigris plant due to the Wathba plant located in the center of Baghdad city while, the East Tigris plant located around Baghdad city, therefore Wathba plant was highly eradicated to contamination than East Tigris plant.

All of these concs. of chloride were within the limits of chloride standards (APHA, 1995; Nollet, 2007).

Nitrite

Nitrite was No detected in any studied stations.

Bromide

Bromide was present only in two locations are RWET and RWW with average 0.1 mg/L for August and September, 2008.

The bromide was firstly determine in the present study by IC technique, because no another comparative study was concern this anion in water analyses – especially in Iraq – so in Iraqi standardization does not employed this anion in routine work.

Nitrate

The concentration average of nitrate determines by IC in various locations for August and September, 2008 was as follow:

RWET: 1.9 mg/L
DWET: 1.9 mg/L

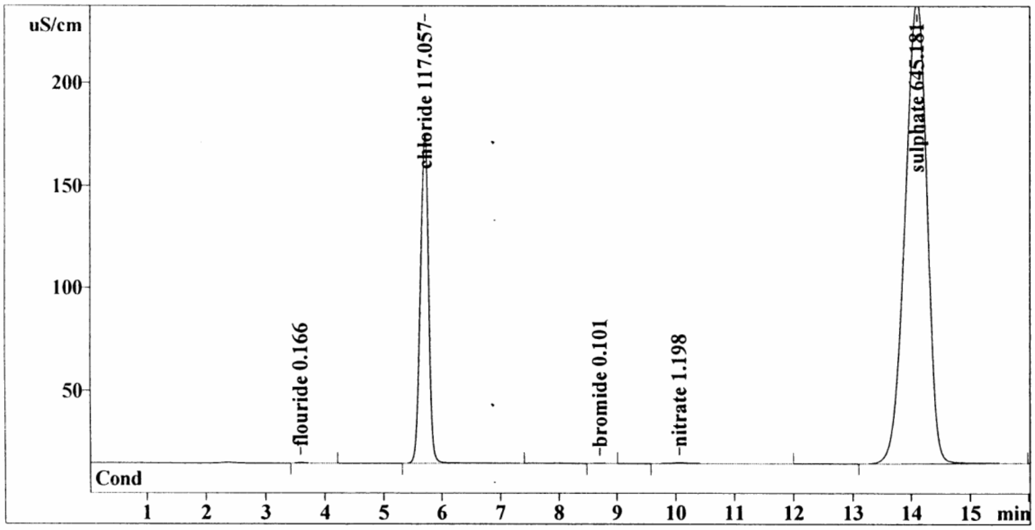

Figure 3. Chromatogram of common anions in raw water sample for Wathba plant.

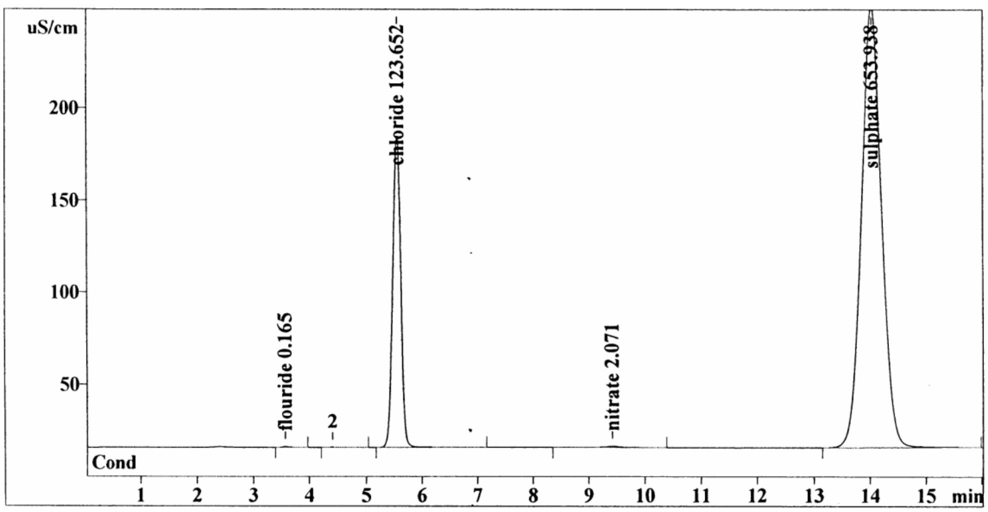

Figure 4. Chromatogram of common anions in drinking water sample for Wathba plant.

RWW: 1.15mg/L
DWW: 1.35 mg/L

It's noted that the values of nitrate are highly in East Tigris plant rather than Wathba plant because of presence of chemical fertilizers and / or pesticides that containing nitrogen compounds (APHA, 1995; Nollet, 2007).

Ortho-phosphate:

The ortho-phosphate not detect in all water measurements .This result approved with results of routine work in Iraq.

Sulphate

The concentration average of sulphate determines by IC in various locations for August and September, 2008 was as follow:

RWET: 365.0 mg/L
DWET: 410.0 mg/L
RWW: 550.0 mg/L
DWW: 610.0 mg/L

According to our results, we conclude that water after treatment (DW) was highly than that before treatment (RW), that's because, addition of sulphate compounds through water treatment. And sulphate concentrations were always in Wathba plant highly than East Tigris plant due to the same reasons that describe previously in chloride.

All of these concs. of sulphate were within the limits of sulphate standards (APHA, 1995; Nollet, 2007).

REFERENCES

Abid MA, Jamil A, NWFP, RWSSP (2005).

Ahmed K, Ali W (2000). Freeman, K. Environmental Health Perspectives, J. Drainage Water Manag. 4(1&2): 109(7): 2002-A332.

Ainsworth R (2004). Safe piped water: Managing microbial water quality in piped distribution systems. World Health Organization, Geneva.

APHA (1995). Standard Methods for the Examination of Water and Wastewater , 19th ed. American Public Health Assoc., American Water Works Assoc., & Water Environment, Washington, DC, Doust JL, Schmidt M, Doust LL (1994). UNEP and WHO, Water Quality Monitoring. A practical guide to the design and implementation of freshwater quality studies and monitoring programmes, edited by Jamie Bartram and Richard balance, chapter 2, NY, 1996. Biol. Rev. of the Cambridge Philos. Soc. 69: 147–186.

Kahlown MA, Tahir MA, Sheikh AA (2004). Pakistan Council of Research in Water Resources, Islamabad, ISBN: 969-8469-13-3.

Koller G, Hungerbu K, Fent K (2000). Betts, K. S. Environmental Science and Technology 36(15), 2002, 308A-309A. Envir. Sci. Pollut. Res. 7(3):135–143.

Nollet LM (2007). Hand book of water analysis.2nd ed. CRC press.

Omar MA (2000). MSc. Thesis in Environmental Engineering, Institute of Environmental Science and Engineering, National University of Sciences and Technology, Rawalpindi.

WHO (2004). Guidelines for drinking-water quality. 3rd ed., World Health Organization, Geneva.