



Impact of environmental pollution in Rawalpindi — Islamabad

Riaz Ahmed, Pakistan

SUPPLY OF PURE water for drinking and different other industrial purposes is one of the most important jobs and its importance has increased many fold due to the environmental pollution caused by different industries, because all the pollutants ultimately find their way into different water sources through rain and water streams. Among the long list of environmental pollutants heavy and toxic metals are important because of their toxicity at low levels (Friberg et.al., 1985) and are not destroyed rather go on changing from one form to other under different geophysico chemical conditions (Nurnberg, 1985). Cadmium and lead should not be present in water more than 10 and 50 ng/ml levels which are very low and beyond the detection limits of many analytical techniques (Bersier et. al., 1994). Most of the sophisticated analytical techniques are beyond reach of common analytical laboratories. Voltammetry is one of the very sensitive and cheap analytical technique which can be effectively applied for the quality control of drinking water (Wang, 1985, Ahmed et.al., 1996). Voltammetry has been used for the analysis of cadmium and lead in different types of samples (Viqar, et. al. 1992, Ahmed, 1990). An automatic voltammetric method has been worked out for the analysis of cadmium and lead in water. Different soil samples have also been analysed. Pollution levels of these metals in Rawalpindi-Islamabad area are determined and their impact on drinking water is evaluated.

Method

VA Processor 646 and automatic sampler 675 VA both from Metrohm Switzerland with Multimode (MM) hanging mercury drop electrode (HMDE), Ag/AgCl reference electrode, Pt-wire counter electrode were used. All the chemicals used were of pro-analysis grade from E-Merck Germany. Water samples were collected in pre-cleaned polyethylene bottles and acidified with Perchloric acid (0.02M). Known amount of the sample was taken in the cell and measured for Cd and Pb by semi-automatic voltammetric method. A segment was allocated to each metal and in each segment the recording sensitivity is matched to the actual metal concentration.

Results and discussions

Cadmium and lead were measured using differential pulse anodic stripping voltammetry. In this method the desired metals are deposited or preconcentrated on the working electrode and then stripped out of the electrode by scanning potential in the anodic direction and the preconcentrated

metals come out of the amalgam at their respective potential giving an increased signal depending upon the deposition time. In this way the sensitivity of the method can be increased by more than thousand times.

Programmes were carefully developed for proper automatic sampling and computation of results. Peaks of Cd and Pb for water samples were recorded. Then peaks of standards additions also were recorded (Ahmed, et. al. 1996). Method of standard addition was used to avoid any matrix effects. This method is quite efficient for the analysis of these trace metals in water as compared to many other techniques. Both of these metals are measured simultaneously in a single measurement.

To see the general levels of these metals soil and water samples were collected from Rawalpindi-Islamabad area. In table-1 are given the values of Cd and Pb in soil samples collected from different areas of Rawalpindi and Islamabad. It can be seen that levels of Cd and Pb in rural soil samples are not high but samples collected from city busy areas are relatively higher. This effect is more visible from the samples collected along the busy road which shows a definite contribution of traffic for the enormous increase in the levels of lead. It is because lead compounds are added to petrol as anti-knocking agents. Similarly samples collected from industry area have large amounts of these metals particularly lead. In table-2 are given the values of these elements in surface water samples collected. Simly dam is the main water reservoir from where water is mostly supplied to the residents of Islamabad. From Rawal dam reservoir water is supplied to certain areas of Rawalpindi. Both of these water reservoirs are located in Islamabad area and their sources are different nullahs and chashmas emanating from mountains in the north. Thus these are mostly surface waters coming from the melting of snow. In table-3 are given the values of these elements in ground water samples. Ground water is also used for drinking purposes because of the short supply from main reservoirs.

If we compare the levels of these metals in surface and ground water samples the levels of Cd are low in surface water samples as compared to ground water and it was also expected because the surface water samples have low mineral content as compared to ground water, but the levels of lead are higher in surface water which points towards certain pollution of water sources from lead. Although the levels are still within limits but it shows a tendency of water pollution from lead which comes from different sources like automobiles, industries etc. It is also confirmed from the analysis of soil samples.

References

AHMED R 1990, Environmental Pollution Control Studies of Toxic Metals by Voltammetry. Report PINSTECH/NCD-114, pp 1-51

Ahmed, R, 1996, The Nucleus, 33 (1-2) 95-100

BERSIER P.M et. al, 1994, Analyt, 119, 219-232.

Friberg, et.al, 1985, Handbook on toxicity of metals Elsevier/north Holland, Biomedical press, Amsterdam

NURNBERG, H.W. 1985, pollutants and their Ecotoxicological significance, Wiley, Chichester.

VIQAR-UN-NISA, et.al, 1992, Mikrochim Acta, 106, 137-142.

WANG,J. 1985, Stripping Analysis, Principles, Instrumentation and applications, VCH Publishers, Dearfield Beach.

RIAZ AHMED, Nuclear Chemistry Division, PINSTECH, P.O. Nilore, Islamabad, Pakistan.

Table 1. Levels of Cd and Pb in soil and sludge samples

Table 2. Concentrations of Cd and Pb in surface water samples

Table 3. Concentrations of Cd and Pb in groundwater samples