Characterization of trace metal concentration (Al, Fe, Mn, Cu, Zn, Pb) of bulk precipitation in kandy district, Sri Lanka

A.B. Liyandeniya[12], N. Priyantha, M.P. Deeyamulla and W.G.R.C. Wickramasinghe[3]

The atmospheric precipitation is an important phenomenon in which pollutants are scavenged from the atmosphere. Wet deposition accounts for rain, fog and snow, while dry deposition is the accumulation and fallout of aerosol particles and gases without dissolution of water. It is very important to have baseline data on the chemical composition of the atmosphere to take regulatory measures to control atmospheric pollution in Sri Lanka. The main objective of this study was thus to determine selected trace metals (Al, Fe, Mn, Cu, Zn, Pb) in bulk precipitation samples collected weekly in three sampling locations, namely the University of Peradeniya premises, Polgolla and Kandy for a period of one year from August 2013 to July 2014. Trace metals were determined in filtered and preserved rainwater (bulk) samples using Graphite Furnace Atomic Absorption Spectrometer, and volume weighted mean values of selected trace metals were subsequently calculated. Kandy municipality showed the highest contamination and followed the sequence of Al > Zn > Fe > Mn > Cu > Pb and volume weighted mean concentrations of above sequence are 53.6 µg L^{-1}, 38.0 µg L^{-1}, 5.8 µg L^{-1}, 5.4 µg L^{-1}, 4.2 µg L^{-1}, <2.0 µg L^{-1}. Polgolla dam site also recorded some trace metal contamination following the sequence, Al > Zn > Fe > Cu > Mn > Pb and volume weighted mean concentrations of above sequence are 51.5 µg L^{-1}, 40.5 µg L^{-1}, 4.8 µg L^{-1}, 2.4 µg L^{-1}, 1.5 µg L^{-1}, <2.0 µg L^{-1}. Despite less industrialization and less traffic congestion, Peradeniya University premises also showed some extent of atmospheric trace metal contamination following sequence of Al > Zn > Cu > Fe > Mn > Pb and volume weighted mean concentrations of above sequence are 46.1 µg L^{-1}, 44.3 µg L^{-1}, 2.6 µg L^{-1}, 1.9 µg L^{-1}, 1.7 µg L^{-1}, <2.0 µg L^{-1}. Principal component analysis (PCA), used to predict possible sources for the above trace metal contaminants, indicates that Mn, Cu and Zn are originated mainly from anthropogenic activities, such as fossil fuel combustion and burning municipal waste. Al and Fe are mainly originated from natural sources as those metals are the major components of alumino-silicate based earth crust.

Key words: Aerosol particles, Atmospheric precipitation, Bulk precipitation, Trace metals

[1]Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka

[2] ostgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanaka

[3] 3 Department of Chemistry, Faculty of Science, University of Kelaniya, Kelaniya, Sri Lanka.