Acidification and neutralization potentials of rainwater at University of Peradeniya

D.M.R.A. Kumari, A.B.Liyandeniya[2], and N. Priyantha[2]

Constituents present in rainwater affects compositional changes leading to acidification or neutralization, and hence the quantification of constituents in rain water. In this respect, the purpose of the present study was to establish a relationship between acidification and neutralization potential of rainwater particulates via bulk precipitation and ambient air quality via dry deposition. Analysis of 30 samples of bulk deposition and 11 samples of dry deposition collected during the four month period from May to September, 2013 at the University of Peradeniya premises for main ions responsible for acidification and neutralization reveals that Na^{+}, Mg^{2+}, Ca^{2+}, K^{+}, NH_4^{+}, NO_3^{-} and SO_4^{2-} were major ions present in the samples, and further, Ca^{2+} and NH_4^{+} dominated constituents for neutralization of rainwater acidity, while NO_3^{-} and SO_4^{2-} led to high level of acidity.

The regression analysis between the summation of the concentrations of NO_3^{-} and SO_4^{2-} vs. the summation of the concentrations of Ca^{2+} and NH_4^{+} reveals that there is a significant correlation with r = 0.66 for bulk precipitation although the correlation is not good for dry deposition with r = 0.38. This difference can be attributed to the different deposition rates of particulates present in ambient air. . Regression analysis applied on each variable demonstrates that, Ca^{2+} can be present as $CaSO_4$ and $Ca(NO_3)_2$ and NH_4^{+} can be present as $(NH_4)_2SO_4$ and NH_4NO_3. Further analysis of the results of compositional variables indicates that 53.3% of SO_4^{2-} can be explained by Ca^{2+} and NH_4^{+}in bulk precipitation, among which 47.5% appears as $CaSO_4$ and only 5.8% as $(NH_4)_2SO_4$. Further, only 19% of the NO_3^{-} is explained by both Ca^{2+} and NH_4^{+} out of which 6% appears as $Ca(NO_3)_2$ and 13% as NH_4NO_3. In dry deposition, 33.5% of SO_4^{2-} and 95.4% NO_3^{-} were explained by the above two cationic independent parameters, and 33% of SO_4^{2-} appears as $CaSO_4$ and only about 0.5% as $(NH_4)_2SO_4$. Among 95.4% of explained NO_3^{-}, 39.2% appears as $Ca(NO_3)_2$ and 56.2% NH_4NO_3.

The linear regression analysis suggests that, Ca^{2+} is involved in a higher percentage (62.5%) for the neutralization process, whereas the involvement of NH_4^{+} is at lower level of 37.5%.

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[1]Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka. anushkar1990@gmail.com

[2]Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka.
anushkadoluwa@gmail.com, namal.priyantha@yahoo.com