Analysis and Correlation of Inorganic Components in Rain and Snow Collected in Ishikawa Prefecture

MOTOICHI MIYAZAKI,^a EIJI HIRAI,^b NOBORU OKUBO,^a TETSUJI CHOHI,^b MORITSUGU KITAMURA,^c CHIE NAKAGAWA^d and FRANZ-JOSEF ECKER^e

Faculty of Pharmaceutical Sciences, Kanazawa University,^a Kanazawa 920, Japan, Faculty of Technology, Kanazawa University,^b Kanazawa 920, Japan, Ishikawa Research Laboratory for Public Health and Environment,^c Kanazawa 921, Japan, Environmental Protection Center, Kanazawa University,^d Kanazawa 920, Japan and Graduate School of Natural Science and Technology, Kanazawa University,^e Kanazawa 920, Japan

Recently, much attention has been paid to the effect of acid rain on the ecosystem. To evaluate the seriousness of the problem the measurement of inorganic components, especially anions such as chloride, nitrate and sulfate ions, in rain and snow have been carried out. Reactions of such air pollutants are very complicated in the atmosphere at very low concentrations, but the reaction products are expected to contribute to the formation of acidic components of rain.

The rain samples were collected with a rain sampler (Ogasawara Keiki Seisakusho, Type R-500) installed on the roof of a three-story building, Ishikawa Research Laboratory for Public Health and Environment, Kanazawa city, and the snow samples were collected in the suburbs of the city from June, 1984 to March, 1986. The values of pH and electric conductivity (EC), and the concentrations of inorganic components (sulfate, nitrate, chloride, ammonium, calcium, magnesium and ferric ions) in rain samples were determined principally according to the methods officially designated by the Environment Agency. The interesting findings of V-shaped relationships between pH and the total anion/cation components in rainfall could be clearly explained by our proposed assumptions.

Furthermore, the mutual interactions of cationic and anionic components were investigated in the rain samples collected. The equi-molar relationship between cation and anion strongly suggested that both ions would behave as a combined form in the atmospheric environment. These results suggest that the clouds and rain water would take up nitrate, chloride, ammonium, sodium and magnesium ions as salts, such as NaCl, MgCl₂ and NH₄NO₃.