An attempt for evaluation of air dusts by PIXE analysis of *Parmotrema tinctorum*

M. Hirai, H. Fujimaki and K. Sera*

Department of Earth and Planetary Material Sciences, Graduate School of Tohoku University
8-6 Aoba, Aoba, Sendai, Miyagi 980-8578, Japan

*Cyclotron Research Center, Iwate Medical University
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

Abstract

Dust pollution in the air has been examined along the way from Futakuchi valley through Akiu hot spring to metropolitan Sendai. We used elemental abundances in *Parmotrema tinctorum* as pollution indicators. In order to determine the elemental abundances in the lichen we used PIXE analysis.

Each elemental group shows respective special variations: most considerable fluctuations have been recognized for alkaline elements. As for alkaline earth elements, they also fluctuate much, but not so much as the alkaline elements. Transition metals show special variation to similar extents as the alkaline earth elements. Non-metallic elements and light metal shows respective variation along the sampling route. Although silicon is one of the dominant elements as an elemental pollution, calcium, iron, magnesium and potassium abundances in *Parmotrema tinctorum* are much more than silicon abundance.

Assuming that the elemental abundances can be applicable to estimate dust pollution in the air, natural dust and agricultural dust as well as industrial dust can be classified. Sulfide mineral pollutants do not play an important role in the air pollution of the investigated area. Among three dust group, we found significant positive co-variation between sulfur and phosphorus: this might have derived from agricultural fertilizer. Iron and manganese co-vary within small abundances of manganese, but the reason of this co-variation is not clear. Abundance relations among many elements imply that the major dust might have derived from natural sand, natural soil and natural rock powders. None of them displays some kinds of elemental co-variation. It should be emphasized that a remarkably good co-variation between nickel and chromium has been found: this cannot be produced in natural. Such good co-relation must have derived from industrial dust. After all, we would like to point out that air in even countryside area is polluted enough. There is not so much difference between municipal air pollution and countryside air pollution.