

雪表面における二酸化窒素からの硝酸や亜硝酸生成

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Production of Nitric Acid and Nitrous Acid from Nitrogen Dioxide on Snow and Ice Surfaces (¹Osaka Metropolitan University, ²Industrial Technology and Environment Research Department, Hokkaido Research Organization, ³Snow and Ice Research Division, National Research Institute for Earth Science and Disaster Resilience, ⁴Asia Center for Air Pollution Research, Japan Environmental Sanitation Center) ○Arisa Hinoshita,¹ Ayane Yamamura,¹ Yusuke Fuji,¹ Izumi Noguchi², Hiroki Motoyoshi³, Keiichi Sato⁴, and Norimichi Takenaka.¹

During dendritic snowfall, there was an increase in nitric acid in the snow. However, no research has been conducted on the cause so far. It is expected that nitrogen dioxide will react on the snow surface, producing nitric acid and nitrous acid, and that nitrous acid will change to nitric acid through volatilization or oxidation with ozone or hydrogen peroxide. Therefore, we expected that nitrate ions would increase in dendritic snow with a large surface area. In this research, we filled a glass tube with the artificial snow and poured nitrogen dioxide into it. Then, we conducted experiments to see if there was a change in the concentration of the gas generated before and after the reaction between the snow and ice surface and nitrogen dioxide. We used NO_x meter and a continuous nitrous acid concentration measuring device to measure the gas concentration and analyzed the snow after the experiment using by ion chromatograph.

In fact, as a result of reacting snow made using ultrapure water with nitrogen dioxide, when nitrogen dioxide and nitrogen monoxide are removed from the total product, most of it is nitric acid, and more than ten percent is nitrous acid. In the future, we will conduct similar experiments using natural snow and aim to elucidate this process.

Keywords : *nitrogen dioxide; nitrous acid; nitric acid; snow; surface reaction*

樹枝状の降雪時に、雪に硝酸が増加するという結果があった¹⁾。しかし、その原因についての研究はこれまで行われていない。二酸化窒素が雪の表面で反応し、硝酸と亜硝酸を生じ、亜硝酸は揮散もしくはオゾンや過酸化水素による酸化で硝酸に変化するプロセスが予想される。そのため、表面積の大きな樹枝状の雪の時に硝酸イオンの増加が起こるのではないかと予想した。そこで本研究では、ガラス管に、人工雪を詰め、その中に二酸化窒素を流し、雪氷面と二酸化窒素の反応の前後で発生する気体の濃度に変化が生じるかどうか実験を行った。気体の濃度測定には、NO_x 計、亜硝酸濃度の連続測定装置を用い、実験後の雪はイオンクロマトグラフを用い、分析をした。

実際に、超純水を用いて作製した雪と二酸化窒素を反応させた結果、全生成物から二酸化窒素と一酸化窒素を除いた場合、ほとんどが硝酸となり、十数%が亜硝酸である結果を得た。今後は自然雪を用いた同様な実験を行い、このプロセスの解明を目指す。

1) Influence of the growth mechanism of snow particles on their chemical composition. Tsuneya Takahashi, Tatsuo Endoh, Kenichiro Muramoto, Chie Nakagawa, And Izumi Noguchi, Atmos. Environ. 1996, **30**, 1683-1692.