Geophysical Research Abstracts
Vol. 15, EGU2013-10789, 2013
EGU General Assembly 2013

Chemical conversion of sulphur dioxide on Eyjafjallajökull’s volcanic ash from the 2010 eruption

Yoan Dupart, Laurence Burel, Pierre Delichere, Christian George, and Barbara D’Anna

Université de Lyon, Lyon; Université Lyon 1; CNRS, UMR5256, IRCELYON, Institut de recherches sur la catalyse et l’environnement de Lyon, , 2 avenue Albert Einstein, F-69626, Villeurbanne, France(barbara.danna@ircelyon.univ-lyon1.fr (barbara.danna@ircelyon.univ-lyon1.fr)

Volcanic eruptions induce important climatic and weather modifications. When volcanic ashes are emitted into the atmosphere they can travel for several weeks according to their size distribution and altitude of the emission. Eyjafjallajökull eruption, between April 14th and May 23th, is considered as a medium-size eruption. The upper level winds advected ashes over the UK and continental Europe.

During volcanic eruptions high amounts of SO_2 were injected into the atmosphere (from 50 to 200 ppbv)[1]. Previous works showed that SO_2 could be convert into sulfate on mineral dust surfaces under dark conditions[2]. However, no conversion has been studied with real volcanic ashes and under day conditions (light exposure). For this study, real Eyjafjallajökull’s ashes samples, collected on the 2010.04.18 at Seljavellir, were used. The ashes were deposited on a horizontal cylindrical coated-wall flow tube reactor surrounded by 5 fluorescent lamps (340-420 nm). The kinetic studies revealed that the presence of UV-A irradiation enhanced the conversion of SO_2 on ashes samples.

Moreover chemical analyses as XPS, Ion Chromatography and SEM were performed on volcanic ashes before and after exposition to SO_2. XPS and ion chromatography analyzes showed that the presence of light increase the SO_2 uptake on ashes surfaces and convert it into ions sulphate. Beside SEM analyses disclosed that the conversion takes place systematically on an iron oxide site . By combining kinetics and chemical analysis we are able to propose a new mechanism for the SO_2 conversion on mineral surfaces under light conditions.

1. Self, S., et al., Volatile fluxes during flood basalt eruptions and potential effects on the global environment: A Deccan perspective. Earth and Planetary Science Letters, 2006. 248(1-2): p. 518-532.
2. Zhang et al., Heterogeneous Reactions of Sulfur Dioxide on Typical Mineral Particles, J. Phys. Chem. B, 2006