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Gas Analysis | *p*QA/HPR-40 Application Note AN-10038

## **Volcanic Gas, Water and Sediment Analysis**



Pinatubo Volcano Eruption

Volcanoes represent a danger in many places in the world, with eruptions occurring every month. Monitoring and research of volcanoes can utilise analysis of gas, liquid and soil samples and can provide vital information about the levels of the rare earth gas isotopes including argon, neon and helium, and other gases, H<sub>2</sub>S, and SO<sub>2</sub> for example

Hiden Gas Analysis systems are used by volcanologists around the world for realtime gas and liquid analysis. The gas analysis systems can be used to analyse soil/sediment gas, with the measurement of the main volcanic gases and isotopes typically being possible to PPB levels, and even to PPT levels for certain species. The *p*QA analyser is designed specifically for field work and is a compact, portable analyser in a ruggedized case.



Hiden Analytical pQA

Hiden systems are designed for both direct real time analysis of gases, water and sediments in the field (*p*QA) or for discreet sample analysis of collected samples in the laboratory (HPR-40).

Direct gas sampling is ideally suited for long-term surveillance of volcanic systems because it produces a detailed chemical analysis of specific fumaroles (an opening in the earth's crust which emits gases) and vents. Volcanic gas samples are typically collected by inserting a chemically inert and durable tube into a hot fumarole. After allowing the tube to heat until condensation in the tube reaches



equilibrium with the escaping gases, either a specially-designed evacuated-sample bottle or a flow-through sample bottle is attached to the collection tubing.



Sample Collection for Laboratory Gas and Liquid Analysis, at Crater of Teide Volcano, Tenerife

Typically, the full suite of major volcanic gases in the sample can be determined, including water, CO<sub>2</sub>, SO<sub>2</sub>, H<sub>2</sub>S, HCl, HF, CO, and H<sub>2</sub>, other gases such as nitrogen (N<sub>2</sub>), oxygen (O<sub>2</sub>), helium (He), and neon (Ne), if present, plus other trace gases. Hiden's QGA and EGA software have built in algorithms which selects the best masses to use, based on the gases in the mixture.



Deconvolution of Typical Volcanic Gases using Hiden QGA Software

The variety of inlets available with Hiden Gas Analysis systems, allow detailed gas composition analyses, often provide critical information for evaluating volcanic hazards and constructing models that provide insight into the condition of the magma at the depth from which the gases originated.



Earth Gas Analysis in Air using Hiden HPR-20 and QGA Software

Isotopes of light elements, such as hydrogen, carbon, nitrogen, and oxygen, as well as those of noble gases, such as helium, can provide insight into the origin of the volcanic gas and the degree of dilution by atmospheric gases.



3D Plot of Xenon Isotope Analysis in Air using Hiden HPR-20 and EGAsoft

The adaptability of the Hiden Gas Analysis system inlets and software, ensures that the user has multiple options to optimise sample collection and analysis.