

IVHHN ASH SAMPLE COLLECTION PROCEDURES

Introduction

The methods recommended for ash collection depend on the purpose intended for the ash. For evaluation of health hazard, the grain-size distribution and composition of the ash may be assessed and the leachates may be analysed. If chemical analyses are carried out, ash should be dried at $< 40^{\circ}\text{C}$, but for compositional or grain-size analysis, the temperature is not crucial. If research is to be carried out on the leachates and surface reactivity of samples (e.g. for toxicological analysis) it will be important to know the exact post-eruptive history of the ash in terms of rainfall and exposure. The quantity of ash needed should be assessed before collection. For example, grain-size analysis or compositional analysis may need small quantities ($< 10\text{ g}$) of ash whereas several kg may be required for toxicological analysis, particularly if a sample is to be shared between different laboratories. The following procedures should be adapted for the particular hazard assessment or research to be carried out but ensure that the ash samples can be used for grain-size analysis, characterization of composition and leachates, and assessment of volume of erupted material / total accumulated tephra (formation of isopach maps) etc.

Implements for ash collection

- The most cost-effective technique for ash collection is using plastic trays (or buckets) which are cheap and easily cleaned. Trays should have a high rim ($> 5\text{ cm}$) in order to avoid contamination and rain-water overflow. The tray should be large enough to collect a significant quantity of ash (ideally $> 0.1\text{ m}^2$). Netting may be secured across the opening to avoid contamination by birds, insects or plants. Metallic trays should be avoided due to possible contamination in contact with rain water.
- Commercial collection devices are available, such as the ‘frisbee gauge’ which consists of an open-bottomed dish fitted with a dry-foam trap to reduce sample contamination from organic matter. The sample is collected in a collection bottle at the base of the unit. The gauge is fitted with a bird guard and a tripod (lighter for ‘new style’ gauges) which can be spiked to the ground for increased stability. The frisbee gauge relies on precipitation to wash particles through the dish into the collection bottle. The ISO gauge, by the same manufacturer, conforms to ISO standard ISO/DIS 4222 for consistent performance but does not have the foam trap. Information on these products is available on the internet (see References section).



Fig. 1 & 2. Ash collection buckets used by the USGS.



Fig. 3. Frisbee Gauge. Courtesy of www.hanby.co.uk

Routine ash monitoring

- A network of clean trays should be set up around a volcano to form a grid that covers the area of possible ash dispersal.
- Particular attention should be given to the direction of prevailing wind. In the case of a very large area of possible ash dispersal, trays should be distributed at least along the most-likely dispersal axis at increasing distances from the vent.
- Trays should be emptied daily to avoid contamination from organic or minor-eruptive material, ash re-suspension by wind and rain-water overflow.
- If water is present in the trays following eruption, both ash and water should be collected in a bag and then dried in the oven. Trying to remove water from the tray may result in loss of fines, which are crucial in the context of assessing health hazard.

Ash collection following an eruption

- Following an ash fall, samples should be collected as soon as possible to avoid re-suspension of fines by wind, water or human activity.
- If a tray network is not in place, ash should be collected on flat surfaces that were known to be clean before the eruption. Ash collection on grass and ground should be avoided.
- In the case where grass or ground areas are the only surfaces available, ash should be removed carefully, leaving a few mm at the ash-surface interface to avoid contamination.
- Ash can be sprayed or wetted with water to avoid loss of fines during collection (unless original un-contaminated particle surfaces are needed for analysis).
- In the case of heavy ash fall, a core can be taken using, for example, a 30 cm section of drainpipe, to retrieve a representative section of ash. This technique is most effective for compact deposits.
- Store ash in bags. One can use either 'Kraft' paper bags or plastic sealable bags. We recommend Kraft bags as fines may adhere more to the surface of plastic bags (see Kraft bag section).

Labelling of samples

In both routine monitoring and ash collection after an eruption, the following should be recorded:

- Time of eruption.
- Time of collection.
- Location of collection (including grid reference or GPS location).
- Note if the ash is just from one or from multiple events and how long since tray last emptied.
- Area of the tray used or of the surface sampled - ash accumulation is best recorded as mass per unit area.
- State of deposit – dry, wet, contains accretionary lapilli, lithics, pumice, organic matter etc.
- Information on the history of the sample between deposition and collection (e.g. rainfall).
- Distance from vent.
- Distance from main dispersal axis, if well defined.
- Assign a sample number.

After collection

- Dry ash in oven at < 40 °C. If ash is collected in 'Kraft' bags, they can be put directly in the oven without the need for removal from bags. In hot climates, the ash can be dried naturally by leaving it in Kraft bags.
- Weigh the ash sample.
- For safety and transport, store the ash within several sealed bags. Recommended – 'zip lock' bags which are easily re-sealable.

Kraft Bags

Kraft bags can be any sort of tough brown paper bag. For ash collection we recommend bags designed specifically for geochemical soil sampling. For example, the bags manufactured and internationally distributed by Siliconpak (www.charapak.co.uk) are made of high wet-strength Kraft paper using waterproof adhesives and can withstand collection of wet samples and subsequent drying. The bags are available in the following sizes: 3x5, 4x8, 5x10 inches.



Figure 4. 4x8 inch and 5x10 inch Kraft bags.

References

Frisbee Gauge and other similar instruments:

<http://www.york.ac.uk/inst/sei/dust/mines1.html> which also provides a downloadable protocol for use of the frisbee gauge.

<http://www.hanby.co.uk/> - website of the manufacturer of the frisbee gauge and other similar dust collectors.

Kraft Bags: Siliconpak Ltd, UK (www.charapak.co.uk)

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