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EXPLAIN THE METHODS AND PROCEDURES OF GEOCHEMICAL SAMPLES; INCLUDE THE FLOW CHART FOR SAMPLE PREPARATION.

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1. Introduction

Geochemistry involves inexpensive methods of trace metal analysis and has resulted in a variety of applications in geology. In mineral exploration, geochemistry is broadly applied in two different situations. Numerous samples are often collected incidental to other exploration work, such as geological mapping of underground workings. These samples are submitted for trace metal analysis and the results incorporated into the overall geologic interpretation. Geochemical samples can include vegetation, water, soil, and rock materials as an exploration method in its own right.

1. Methods and Procedures

Many different methods are used to collect geochemical samples and procedures to be followed depend on the type of sample in question i.e. rock, soil, water and vegetation. The controlling factors for methods include: site selection and marking sample sites, determining the sample pattern, sample spacing, and this is recorded including sample numbering. Simple geological information can be sketched directly on the geochemical map. If the geological patterns are complex, a transparent overlay is usually more suitable. Geochemical plans and diagrams should show (1) name and location of area, (2) scale and orientation, (3) explanation of symbols, (4) nature of samples, (5) analytical procedures, (6) units used in expressing analytical data, and (7) name of party chief, samplers, and analysts. The technique of collecting samples will naturally depend on what is being sampled, whether rock, soil, vegetation, water, or stream sediment.

**Site selection and marking sample sites** – sites for geochemical sampling are selected according to the purpose of the sampling and after sampling marking may be done by marked stakes, marked rags tied on bushes, blazes on trees, or pieces of paper left in the hole and anchored under a stone.

**Sample pattern** - Sampling of any material on a regional basis is not only easier but commonly more effective if it is laid out on a simple geometric pattern. In geochemical surveying, sample patterns should be made to fit the geometry of the expected anomalies. Most geochemical anomalies are the result of movement either through well-defined channels (dispersion trains), spreading predominantly to one side of the source (dispersion fans), or spreading upward or outward in all directions from the source (dispersion halos). Different sample patterns are needed for the most efficient delineation of anomalies of these different shapes aerial sampled and cannot be laid out on a previously established geometrical grid.

**Sample spacing** - The spacing of samples should be close enough so that no important anomaly could normally be overlooked. If the anomaly is inhomogeneous, so that a proportion of the samples taken within an anomalous area will fail to indicate the anomaly, correspondingly more samples will be necessary than if the anomalous values are distributed uniformly. Also, if erratic high values of no economic significance occur outside the anomalous area, a closer spacing of samples should be considered. In some cases, it may be safer to use a wider spacing for the initial survey and to plan on immediate rechecking of all anomalous spots with detailed grids.

**Numbering samples** - In its geochemical prospecting work, the Geological Survey uses systems of simple accession number for each job so that samples are numbered consecutively with simple Arabic numerals in the order in which they are taken, regardless of the nature of the sample. Even so, skipped or duplicated numbers will turn up from time to time; when numbers are duplicated, both samples bearing the identical number become worthless and have to be resampled, often at considerable cost. This may be avoided by printing or writing a consecutive series of numbers on gummed tape and then tearing off the appropriate number from the coil of tape and pasting it on the container when the sample is collected. If envelopes or other flat containers are used, the number may be marked on the empty containers in advance. In addition to the number, every sample container should adequately identify the project. This may be done easily with a hand-set rubber stamp showing name of project, location, name of collector, and year.

**Rock -** Elements occurring in rocks as primary dispersion patterns may be either evenly disseminated throughout the rock mass or segregated as clots or swarms of minute fracture fillings. If it can be established that the rock is relatively homogeneous, single grab samples may suffice. If the composition is spotty and erratic, however, it is safer to collect either channel samples or chip samples composited along sections of traverse. Split diamond-drill core is also suitable. The size of sample should be governed by the relative homogeneity of the material, a factor that can be determined, by preliminary experiments. Ten grams is adequate for most analytical methods. Cloth sacks and cylindrical ice-cream cartons are suitable as containers for rock samples in working with, primary dispersion patterns; it is well to remember that the distribution of metals in residual soils may reflect the general pattern of the primary anomaly in the parent rock fairly accurately.

**Soil** - In stony soil it is usually easier to prepare sample holes with a pick and shovel. A geologic pick or a folding Army foxhole shovel has been found satisfactory for shallow holes. In clay soils, a soil auger is usually easier and faster than the pick-and-shovel technique. A suitable soil auger may be assembled by brazing or welding a large wood-auger bit to a section of light iron pipe, and attaching additional lengths of pipe as needed for greater depth; a T-shaped handle may then be fitted to the top section of pipe. It is found that the auger bit is more effective in cutting through soils if the leading screw point is cut out. The standard procedure adopted for Geological Survey work has been to collect the fines (minus 80 mesh) for analysis and discard the coarse fraction. This avoids the need of grinding the sample before analysis and may cut down erratic data resulting from possible coarse fragments of oxidized ore minerals such as lead carbonate or malachite. An alternative procedure is to collect all sizes less than 2 mm in diameter and grind before analysis. This procedure may be preferable where the soil lacks an appreciable, proportion of fines or where the ore metal is concentrated in the coarser sizes.

**Stream sediments** - Where the heavy-mineral content of sediments is to be measured, it is usually desirable to collect the sample from the surface of bedrock beneath the stream channel. This may require either digging a pit or augering a hole, if the bedrock is buried beneath a heavy cover of alluvial material. Where the unstable component of the stream load is being mapped, suitable samples can be obtained from deposits of silt either in the stream bed or exposed under the sod or forest litter on the banks of the stream. Under some conditions samples from older alluvial terraces may be suitable.

**Vegetation** - Samples of vegetation for chemical analysis should be taken far enough above the ground to be clear of contamination from rain spatter. It is important to confine a geochemical plant survey to samples taken of the same organs of the same species to be sure of obtaining comparable data. The collector must, therefore, be able to recognize the tree species to be used. Wood can be collected either from the main trunk with a carpenter's auger or from branches sawed or chopped off and stripped of leaves and bark. Leaves and needles can most conveniently be removed from twigs by first allowing the sample to dry and then stripping off the brittle foliage. The same way of removing needles can be used in surveys where the metal content of the needles alone is required.

**Water** - The collection of water samples presents a special problem not found with other kinds of material in that the content of traces of metals is relatively unstable. The most serious difficulty is the removal of ions from solution by adsorption to the walls of the vessel in which the water sample is stored. Metal may also be removed from solution by co-precipitation with the iron hydroxide precipitates that commonly form when water is stored for any length of time. It is reported that these effects can be minimized by acidifying the sample immediately after collection, in order to inhibit both exchange reactions and hydrolysis. If a soft-glass vessel is used, some of the metal contained in the glass may go into solution to contaminate the sample; this may be avoided by using containers made of either borosilicate glass or plastic. Polyethylene bottles with screw-cap tops are probably the most suitable, as they are not only free of contamination but also unbreakable.

1. Conclusion

Geochemical sampling is the most effective in determining mineral composition of given specimen, and is applied effectively as an exploration technique to provide comprehensive data on mineral deposit quantification for exploitation.

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