LABORATORY SERVICES

Botswana Geoscience Institute
Excellence in Geoscience

Introduction

BGI Laboratory Testing Services consist of the Physical and Chemical testing laboratories which provide timely and quality analytical services and assessments on geological raw materials such as soil, rock, ores, vegetation and water as well as material testing for research projects of BGI, mineral exploration companies and the general public.

The laboratory is staffed with competent personnel and a wide range of well maintained modern equipment that enables it to produce quality and timely analytical results. Quality of results is assured by use of quality control protocols.

Test methods used in Laboratory services are internally developed and validated as per ISO/IEC 17025 requirements. The Laboratory services also perform testing according to internationally recognized standards provided by standardization organizations such as American Society for Testing and Materials (ASTM), International Organization for Standardization (ISO).

The laboratory uses Laboratory Information Management System (LIMS) to monitor its technical and management processes.

Instrumentation and techniques

Physical Tests

Jaw Crusher, Mill Barrel & Sieve

The Retsch Brand sample preparation equipment (Jaw crusher, Disk Mill, and Mill Barrel) enables sample preparation for analysis with minimal contamination. Geochemical samples of >75 micron is achievable.

Discoplan Ts & RotaPol

The Discoplan Ts and RotaPol thin section system for preparation of mineralogical samples. The system enables precise cutting, grinding and polishing of rock sections to desired standards of 30 micron sizes

Nikkon Microscope

The Nikon Petrographic Microscope for Petrology and Optical Mineralogy to identify rocks and minerals in thin sections.

X-Ray Powder Diffraction

X -ray Powder Diffraction (XRD) is a rapid analytical technique used primarily for phase identification of a crystalline material and unit cell dimensions. The analyzed material is finely ground, homogenized, and average bulk composition is determined. It is equipped with automatic 15 chamber samples loading magazine, sample spinner, flat and multipurpose stages to enable flexibility in sample analysis.A choice of detectors such X'cellerator, mini proportional and collimator is also possible depending on the requirement of the sample.

Presidium DUO Diamond Tester

PDT differentiates diamonds from its simulants based on both their thermal conductivity and reflective indexes. coated gemstones can also be generally tested with the PDT.

The Presidium Duo Tester comes with a probe pen that has a retractable probe tip which ensures consistent pressure against the gemstone during testing for more reliable results. It has a thin probe tip size of 0.6mm that can test gemstones as small as 0.02ct.

Does not differentiate between natural and synthetic colored gemstones though.

Laser Diffraction

The Malvern Mastersizer uses Laser Diffraction Technique to measure the size of particles. These could be suspensions of solid particles, emulsion droplets, or even dry powders. Measurements can be done only on particles ranging from 2 to 2000 Microns.

The Aggregate Impact Tester is used for determining the aggregate impact value of aggregates.

Aggregate Impact Tester

Compressive Strength Tester

Compressive Strength Tester, measures the maximum amount of compressive load a material can bear before fracturing. Materials up to 2000kN can be tested.

Ceramic Testing

Materials investigation through testing properties such as atterberg limits,

shrinkage, firing temperature, water absorption, Loss on ignition, strength, efflorescence, ring, mineralogy , carbonate and organic matter content.

Hardness Testing Kit

The kit contains Gypsum, Talc, Calcite, Fluorite, Apatite, Orthoclase, Quartz, Topaz and Corundum. It enables identification of minerals by testing their scratching properties depending on their hardness.

Chemical Tests

Phoenix Fusion Machine

This machine is used for fusing pulverized solid samples to form 37mm diameter glass beads that are portable with Zetium XRF sample changer cups. The sample is weighed together with a relevant flux and fused through a pre-set fusion program in the machine.

The Zetium XRF is a non-destructive analytical technique used to determine the chemical composition of wide range of sample types eg. geological samples, mining. The machine use X-rays to determine analytes of interest in a sample.

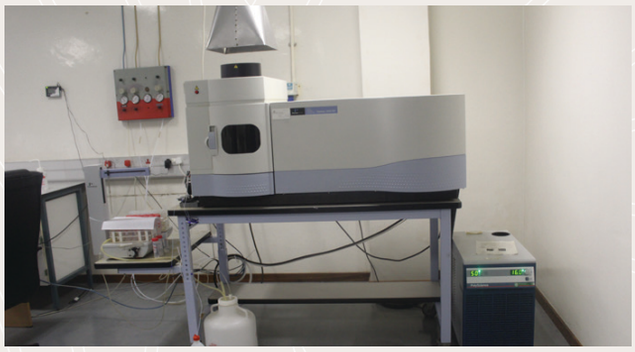
Zetium X-Ray Fluorescence Machine

Carbolite Furnace

Carbolite furnace is used for determination of Loss-on-Ignition (LOI). The sample is heated at around 9500C and the final weight compared with that of the pre-heated sample to determine if there is any weight difference due to organic matter and carbonate content

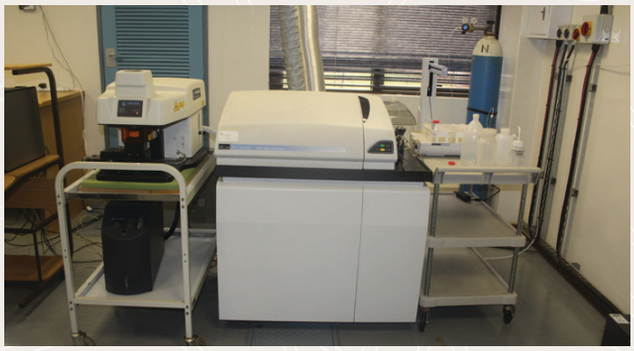
Microwave Digestion System

The Microwave Digestion System is used to perform complete dissolution of chemical elements in a geological sample at high temperatures and pressure. The samples can be analyzed for either major or trace elements with ICP-OES or ultra traces with ICP-MS



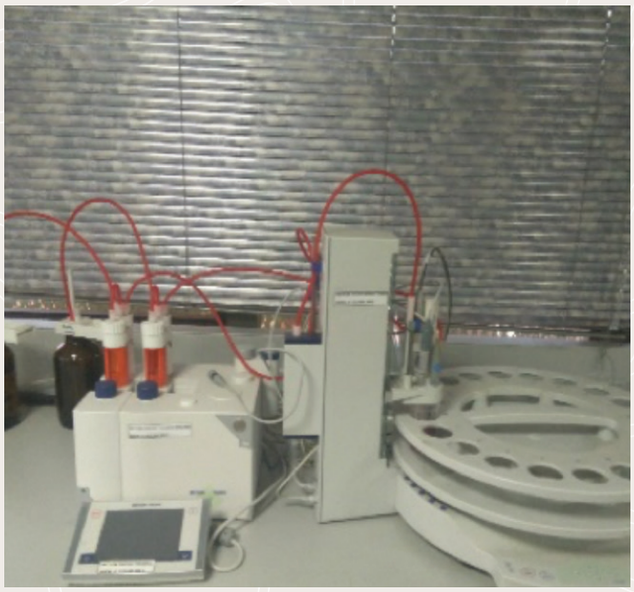
ICP-OES 7300 DV

Optical Emission Spectrometer is a multichannel technique that has important advantages for geoanalysis. It is able to determine 20-60 elements simultaneously in a cycle time of 3-5 minutes, and its long dynamic range allows for the determination of both major and trace in geological material.



Elan DRC-e ICP-MS

Perkin Elmer ELAN dynamic reaction cell-e Inductively Coupled Plasma-Mass Spectrometer is a rapid multi-element technique with low detection limits up to parts per million / trillion used for determination of trace, Ultra trace elements and Rare Earth Elements in geological material



Mettler Toledo Auto-titrator T90

Table -: Techniques used by BGI Laboratory

EQUIPMENT/TECHNIQUE	TYPE OF SAMPLE	PARAMETERS/ANALYTES TESTED
X-ray Powder Diffraction	Rocks and Soil	Mineral Identification
Laser Diffraction	Soil	Grain Size Distribution
Alpha Diamond Tester	Rock	Diamond Identification and classification
Sieving	Soil and Aggregates	Grain Size Distribution
Presidium Diamond Tester	Rocks	Mineral Identification
Polarizing microscope	Thin Section	Mineral Identification
Reflectance Microscope	Minerals	Minerals Properties
Hardness Tester	Minerals	Minerals Properties
Compression Machine	Rocks and Solids	Strength
Aggregate impact Tester	Rocks and Solids	Strength
Jaw Crusher	Rocks	
Aggregate Crushing value	Rocks	Strength
Mill Barrels	Rocks and Soil	Sample Pulverization
Discoplan Ts& RotaPol	Rock	Thin Section
Brick-earth Properties	Clay	Atterberg limits, Shrinkage, Firing Temperature, Water absorption, LOI Strength, efflorescence
Pottery	Clay	Atterberg Limits, Shrinkage Temperature, Strength
Los Angeles Abrasion	Rock	Abrasion Resistance

Table -: Techniques used by BGI Laboratory cnt'd

Water Absorption	**Rock**	**Water Absorption**
Methylene Blue	Rock	% Clay Content
Specific Gravity	Rock and soil	Specific Gravity
Bulk Density	Rock	Density
ICP-OES 7300 DV	Soil, Rocks, Precious Metals and Water	Al, Au, Be, Cd, Co, Cr, Cu, Fe, Mn, Pb, Zn etc.
ICP-MS	Soil, Rocks, Precious Metals and Water	Ultra trace Isotopes and Rare Earth Elements
Zetium X-Ray Fluorescence	Soil & Rocks	Al_2O_3, SiO_2, Fe_2O_3, MgO, CaO, MnO, Na_2O, K_2O, P_2O_5 and TiO_2
Ion Chromatography (ICS 3000)	Water	F^- , Br^- , C^{l-} , No^{2-} , No^{3-} , PO_4^{3-} , SO_4^{2-} , Ca^{2+} , Mg^{2+} , Na^+ , K^+ , pH & EC

SERVICE	TURNAROUND TIME
Mineral Identification	1 day for a batch of 12 samples
Grain size analysis	1 day for a batch of 50 samples
Thin section preparation	5 samples per day
Preparation for geo-chemical analysis	20 samples per day
AIV/AIC	1 sample per day
Atterberg Limits	3 days for a batch of 5 samples
Geochemical analysis	14 working days for rock samples 16 working days for soil samples
Water analysis	5 working days

OUR PRICE LIST

Information on pricing is available upon request.
Or you can visit **http://www.bgi.org.bw/laboratory-services-price-list**

Notes

Notes

Botswana Geoscience Institute

Excellence in Geoscience

For Further information Contact

Postal address: Private Bag 014, Lobatse, Botswana
Physical address: Plot 1734, Khama 1 Avenue.
Telephone: +267 5330327
Fax: +267 5334295
Email. info@bgi.org.bw
www.bgi.org.bw