PRELIMINARY ASSESSMENT
TECHNICAL REPORT

EMGOLD Idaho-Maryland Mining Corporation

Appendix D

Sample Protocols and Testing

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Chain of Custody of Ceramic Feedstock Metavolcanic Resource Samples

Carl E. Frahme, Ph.D.

Golden Bear Ceramics has instituted and followed a stringent program of thoroughly documenting and retaining all laboratory data and information, of maintaining a traceable chain of custody for all materials and processed samples, and of safely storing all samples and materials for archival purposes. These procedures are routinely used for all development work and have been followed for the metavolcanic resource evaluation recently conducted.

As part of the ceramic feedstock metavolcanic resource evaluation, various labeled material samples were sent to KCA in Reno by the Idaho-Maryland Mining geology staff for whole rock chemical and other analyses and for grinding for evaluation by the Golden Bear Ceramics (GBC) technical staff. The ground materials were received by GBC, labeled as described in the ***Ceramics Feedstock Meta-Volcanic Resource*** document.

As part of the ceramic feedstock evaluation, most of these various materials were processed into ceramic billets in the first generation laboratory extruder (referred to as Gen I). In excess of twenty materials were so processed. The original label designations were retained, and all process work and conditions were recorded in detail in bound laboratory notebooks, with numbered, dated, and signed pages. A composite blend of the resource materials was formulated by Robert Pease, Chief Geologist- Idaho-Maryland Project, and prepared according to his memo of August 19, 2004. This "Composite Metavolcanic" blend was given the label CX-1075. This material was processed at a range of process temperatures and conditions in order to find the optimum processing parameters. Because of time constraints, all initial processing was done on uncalcined materials. CX-1075 and several other materials were processed as calcined materials as well, since ultimate processing will use calcined raw material. Processed billets were labeled with the sample designation and Lab Notebook designation to keep all samples and multiple processing clearly delineated. Direction of pressure application and extrusion was also marked on the samples. All samples have been stored in marked plastic trays in a storage chest.

Each material was then subjected to physical testing. From each billet, twenty small test bars were cut from each billet using a diamond core drill. The position of each cut bar relative the ceramic billet was recorded and retained. Samples 1-20 were placed in numbered partitions in twenty compartment plastic boxes. Each box was labeled with its sample label and the Lab Book run designation. Each of the twenty bars was broken to determine modulus of rupture (MOR) and the load and dimensions recorded on a master sheet for that sample set. After breaking, each bar pair was returned to its individual plastic box compartment.

Each of the twenty pairs of broken bars was then labeled sequentially 1, 2, 3, etc. with permanent black ink and subjected to water absorption, porosity, and specific gravity measurement using a standard ASTM test method. The data were recorded on the same master data sheet used for MOR data. The dry mass, suspended mass, and saturated mass were measured and recorded. The samples were returned to their proper plastic box compartments for storage.

The MOR and water absorption/gravity data were analyzed via an Excel spreadsheet. Since all position data for each sample were retained, the physical properties have been analyzed not only as an average for each ceramic billet sample but also by position from that billet.

In addition to physical property measurements, a number of the raw materials have been submitted for x-ray diffraction analysis in both uncalcinied and calcined form to determine the crystalline phases present. As time permits, more XRD analysis will be undertaken. The original sample labeling was used for this work as well.

A few analyses using the thermal gradient furnace recently commissioned have been completed. Samples of uncalcined and calcined historic Idaho-Maryland tailings (HIMT) and CX-1075 composite metavolcanics have been tested. This allows comparison of HIMT, the only material extruded in the second generation continuous extruder (referred to as Gen II), with the composite material CX-1075. HIMT has also been evaluated extensively in Gen I, so comparisons between the Gen I data for all materials are very helpful in predicting how the ceramic resource materials will process in Gen II. It appears that the ceramic resource materials will all process very similarly to HIMT, based on this comparison.

All raw materials are retained in sealed containers at the pilot plant. All processed samples are stored in the laboratory or in the pilot plant in plastic containers or, for larger samples, in cardboard or wooden boxes. Data and observations are kept in bound laboratory notebooks with numbered, dated, and signed pages (from Scientific Bindery Productions). Data book pages are scanned into the LAN for backup storage and retrieval. Certain data files are generated, analyzed, and kept on laboratory computers because of the calculations and statistical analysis required. These files are transferred to the corporate LAN for backup at least once a month.

In summary, all materials have been scrupulously labeled and tracked throughout the evaluation process, and all samples have been stored and are available for further evaluation and comparison.

Test Procedures for Golden Bear Ceramics and Idaho-Maryland

Carl E. Frahme, Ph.D.

Modulus of Rupture (MOR) Testing

MOR is determined for process samples using a slightly modified ***ASTM C 674-88 (Reapproved 1999)***, ***Standard Test Methods for Flexural Properties of Ceramic Whiteware Materials***. Test bars are diamond core drilled from processed ceramic billets using an internal standard procedure. Bar diameter is nominally 0.25" in diameter, as called for in the test. Because of the size of the billets, the test span is typically 1.25" instead of the 4" span specified by ASTM. All tests are run on the same basis. In most cases, 20 samples from each composition and process condition are broken, instead of the minimum of ten specimens required by ASTM. This is done on Gen I sample ceramic billets in part to measure strength in relation to the position in the billet and to assure statistical relevance. Test results have consistently been consistent and showed very acceptable levels of statistical variability. All tests have been conducted in-house under the supervision of Carl Frahme and Dr. Robert Villwock. When enough samples are available, measurements will be made for comparison at Holdridge & Kull, Consulting Engineers, in Nevada City, CA. Samples are stored in 20-compartment plastic boxes.

Porosity, Water Absorption, and Apparent Specific Gravity

These properties are measured using unmodified ***ASTM C 373-88 (Reapproved 1999), Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products***. Measurements are generally made on the broken MOR test bars so that direct correlations between flexural strength and absorption and porosity can be made.

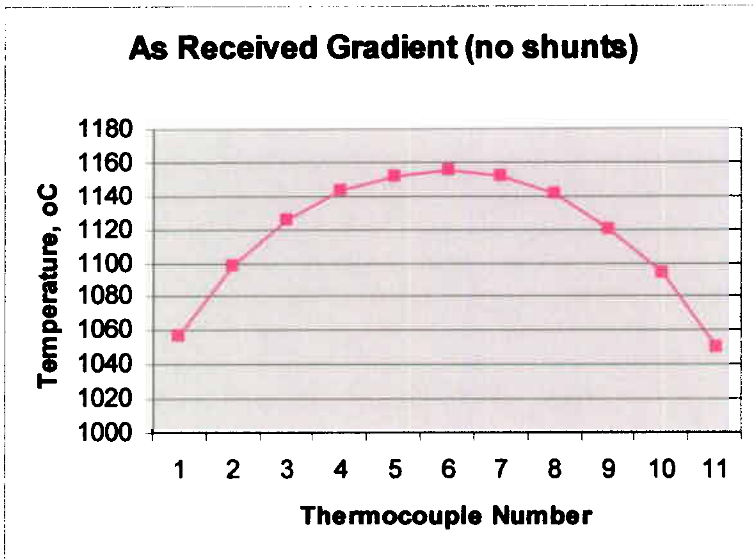
X-Ray Diffraction (XRD)

X-Ray diffraction (XRD) analysis to determine crystalline phases present has been carried out by Dr. Jim Post using his personal XRD equipment. Dr. Post, an independent mineralogist, has many decades experience in identifying phases present in all sorts of minerals and mine rock. Dr. Post maintains his x-ray diffraction and x-ray fluorescence equipment in the Idaho-Maryland building.

Whole Rock Chemical Analysis

Whole rock chemical analysis has performed on 24 different rock samples for the ceramic feedstock evaluation as well as for a large number of other materials by Kappes, Cassiday and Associates (KCA) of Reno, NV. KCA, and its Florin Analytical Services group, are highly regarded in the mining industry, with decades of experience. They also have analyzed for carbon and total sulfur and some trace metals.

Thermal Gradient Furnace
A gradient furnace has been built based on a standard horizontal tube furnace. The furnace has two alumina "Dee" tubes along its 24" inside length, each tube 12" long. Thermocouples are placed in this hearth at the center and at 2" increments from the center, giving a total of eleven temperature readings. A typical gradient plot for the furnace is given below. The midpoint temperature can be set as high as 1200°C, or at any other lower temperature. Two Inconel 601 metal trays, lined with refractory ceramic paper, and filled with material to be exposed to the temperature gradient are placed in the furnace and the furnace is raised to the desired temperature. In one such run the effect of temperature on the test materials can be seen, and samples from the test bar can be analyzed for properties.



Gradient furnaces are a common R&D tool in the ceramic industry, since they allow a large amount of firing information to be collected quickly. There are no standard designs or no ASTM Standards, but this is a recognized tool in the industry.

Sample Storage Before and After Testing
All samples are properly labeled for chain of custody and traceability and securely stored in plastic containers, plastic zipper sealed bags, or plastic, cardboard, or wood containers, depending on the nature of the samples. Raw materials, calcined powders, and remaining XRD powder samples are stored in plastic drums or bags or, for small samples, in zippered plastic bags. Processed samples and their containers are both labeled. Samples containers are stored in the ceramic laboratory or in the pilot plant.

Verification Testing Procedures
Testing procedures have been validated by running duplicate tests and by analyzing variability statistically. In general, ASTM test procedures have been used. Balances have been calibrated. Temperatures have been checked by duplicate thermocouples and by use of a precision double wavelength radiation pyrometer.

Data Storage and Management
Most data, test conditions, objectives, and observations entered into bound, numbered, dated, and signed laboratory notebooks. Some process data is stored via Labview™ software and data acquisition hardware into a laboratory computer. For convenience, breaking loads for MOR and mass measurements for water absorption, porosity, and specific gravity measurements are entered onto data sheets in a three ring binder. This data is then transferred into a computer database for analysis and is electronically stored. Numbering and labeling systems are used to preserve chain of custody and traceability.

Approximately once a month laboratory notebooks are scanned into a corporate LAN database for backup and archiving. Likewise, laboratory computer data files are backed up into the LAN.