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ANALYSES OF HISTORIC U.S. BUREAU OF MINES ROCK AND HEAVY MINERAL CONCENTRATE SAMPLES FOR GEOCHEMICAL TRACE-ELEMENT AND RARE-EARTH-ELEMENT DATA: RAY MOUNTAINS AND KANUTI–HODZANA UPLANDS AREA, ALASKA

by
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ANALYSES OF HISTORIC U.S. BUREAU OF MINES ROCK AND HEAVY MINERAL CONCENTRATE SAMPLES FOR GEOCHEMICAL TRACE-ELEMENT AND RARE-EARTH-ELEMENT DATA: RAY MOUNTAINS AND KANUTI–HODZANA UPLANDS AREA, ALASKA

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INTRODUCTION

Anomalous concentrations of base metals, tin, tungsten, chromium, rare-earth elements (REEs), and uranium were discovered in the Ray Mountains and Kanuti–Hodzana uplands regions of Interior Alaska in the 1970s as part of the National Uranium Resource Evaluation (NURE) Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) program. These historic datasets are currently archived in the National Geochemical Database (Smith, 2006). Subsequent resource assessments by the U.S. Bureau of Mines (USBM) located and described bedrock and alluvial tin occurrences (Barker and Foley, 1986), bedrock chromite occurrences (Foley and McDermott, 1983), alluvial rare-earth-element occurrences (Barker, 1992), and alluvial tin and tungsten occurrences (Barker, 1983). Historic sample materials were transferred from the USBM to DGGS's Alaska Geologic Materials Center (GMC) as part of the federally funded Minerals Data and Information at Risk in Alaska (MDIRA) program in the late 1990s and early 2000s.

Re-analyses of sample pulps and bulk rejects from historic USBM rock and heavy-mineral-concentrate samples are being conducted by the Alaska Division of Geological & Geophysical Surveys (DGGS) as part of the State of Alaska's *Strategic and Critical Minerals Assessment* project, which is designed to evaluate Alaska's potential for these resources. The objective of this resource assessment is to expand the state's geochemical database by obtaining and publishing modern, quantitative geochemical analyses for historic USBM samples, where available. Highlights of this re-analysis project include heavy mineral concentrates with up 7,220 ppm Sn, 5,870 ppm Cr, and 17,000 ppm Mn.

The text and analytical data and tables associated with this report are being released in digital format as PDF files and .csv files. Additional details about the sampling project can be found in the metadata file associated with the digital version of this report, which is available from the DGGS website (http://dggs.alaska.gov/pubs/id/25581) at no charge.

DOCUMENTATION OF METHODS

SAMPLE COLLECTION

Historic heavy-mineral-concentrate samples were collected by the USBM for two different projects over the span of 14 years. Samples numbers with a KA prefix were collected from upland drainages along the Trans-Alaska Pipeline System (TAPS). These samples were collected with a shovel from the center of active channels in smaller streams, or from the leading edge of gravel bars on larger streams. Samples were then panned using a 14-inch pan until about 50 to 100 grams of material remained. Bromoform (+2.85 specific gravity) was then used to further concentrate the air-dried samples. The concentrated samples were then screened with a 14-mesh (1,190 micron) screen. The material that passed through the 14-mesh screen was then magnetically separated. The non-magnetic portion was pulverized for analysis (Barker, 1983; Stablein, 1980). Samples with an RM prefix were collected from either the Ray River or on upper No Name Creek. Five of the samples (RM25238, RM21656, RM21657, RM23722, and RM23752) were collected 150 feet above No Name Creek from a gravel pit that contained paleochannels. All other RM samples were collected from cutbanks at water level or streambeds. The samples were concentrated by screening through a 0.5-inch and a 16-mesh screen, respectively, followed by either hand panning or tabling the undersize (Barker, 1992).

Historic rock samples were collected by the USBM as float or rock chips from mineralized localities and were crushed and pulverized (Barker, 1992; Stablein, 1980).

Location data for each sample were derived by scanning the station-location map figures from historic USBM reports, georegistering the map figures in ArcGIS v. 10.0, creating a point layer of station locations, and extracting latitude–longitude coordinates.

SAMPLE PREPARATION

Sample pulps were retrieved, examined, and split by DGGS at the GMC in late 2011 and early 2012 into aliquots needed for the analyses, with leftover portions of the pulps saved and stored at the G**MC**. The splits of the pulps were submitted to ALS Minerals laboratories for analysis in the spring 2012.

ANALYTICAL METHODS

All samples were analyzed for ore-related trace elements and the full suite of rare-earth elements. In addition to the internal quality-control program at ALS Minerals accredited to ISO/IEC 17025-2005 standards, DGGS monitored analysis quality by inserting ore-geochemical-pulp standards with known compositions into the sample roster for every sample batch.

a. Trace-element compositions were determined using inductively coupled plasma atomic emission spectroscopy (ICP-AES) following a four-acid digestion process.
b. Rare-earth and additional trace-element compositions were determined using inductively coupled plasma mass spectroscopy (ICP-MS). ICP-MS samples were dissolved in acid following lithium metaborate fusion.
c. Platinum, palladium, and gold values were obtained from a 30 g sample using inductively coupled plasma atomic emission spectroscopy (ICP-AES) following aqua-regia digestion-fire assay.
d. Some samples were retested for quality control purposes; the results were not included in the publication because the percent variance of the samples had a mean of 1.25 percent, and presented no significant change.
e. Several samples with elements (Sn, Th, Zr) above the detection limits in the analytical methods described above were re-analyzed using X-ray fluorescence following lithium borate fusion.

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