CCRMP
Canadian Certified Reference Materials Project

CANMET Mining and Mineral Sciences Laboratories
555 Booth Street, Ottawa, Ontario, Canada K1A 0G1
Tel.: (613) 995-4738, Fax: (613) 943-0573
E-mail: ccrmp@nrcan.gc.ca
www.ccrmp.ca

PCMRC
Projet canadien de matériaux de référence certifiés

Laboratoires des mines et sciences minérales de CANMET
555, rue Booth, Ottawa (Ontario) Canada K1A 0G1
Tél. : (613) 995-4738, Téléc. : (613) 943-0573
Courriel : pcmrc@rncan.gc.ca
www.pcmrc.ca

Certificate of Analysis

First issued: September 2004 Version: January 2010

HV-2

Copper- Molybdenum Ore Certified Reference Material

Table 1 - Certified Values

Element	Unit	Mean	Within-Lab Standard Deviation	Between-Labs Standard Deviation	95% Confidence Limit
Cu	%	0.57	0.02	0.03	0.02
Mo	%	0.048	0.002	0.003	0.002

Table 2 - Informational Values

Element	Units	Mean	Standard Deviation	Element	Units	Mean	Standard Deviation
Ag	µg/g	2.2	0.3	Ni	µg/g	4.18	1.59
Al_2O_3	%	16.4	0.2	P_2O_5	%	0.09	0.02
Ba	µg/g	567	11	Pb	µg/g	8	3
C Tot	%	0.61	0.01	Pr	µg/g	2.1	0.10
CaO	%	3.02	0.46	Rb	µg/g	43.1	1.99
Cd	µg/g	1.8	1.0	S	%	0.57	0.07
Ce	µg/g	17.4	0.6	Sb	µg/g	7	1
Co	µg/g	2	0.6	Sc	µg/g	3	1
Cs	µg/g	2.0	0.20	SiO_2	%	65.51	1.38
Dy	µg/g	1.1	0.1	Sm	µg/g	1.50	0.16
Er	µg/g	0.6	0.2	Sr	µg/g	491	21
Eu	µg/g	0.5	0.1	Tb	µg/g	0.14	0.04
Fe	%	1.09	0.47	Th	µg/g	0.97	0.04
Ga	µg/g	22	0.76	TiO_2	%	0.18	0.03
Gd	µg/g	1.4	0.23	U	µg/g	1.4	0.2
K_2O	%	2.38	0.21	V	µg/g	57	8
La	µg/g	9.2	0.59	W	µg/g	3	0.5
LOI	%	4.72	0.64	Y	µg/g	5.5	0.77
MgO	%	0.52	0.06	Yb	µg/g	0.65	0.14
MnO	%	0.06	0.006	Zn	µg/g	56	10
Na_2O	%	2.91	0.34				

DESCRIPTION

The source material for HV-2, two lots of ore grade material and a molybdenum concentrate, was donated by Highland Valley Copper in Logan Lake, British Columbia in 1997. The ore grade materials were dried at 66°C for 24 hours and the concentrate was dried at 105°C for 4.5 hours. After crushing and sieving each component separately to a mesh size of less than 75 µm, the yields were 49% and 47% for the two ores, and 7% for the concentrate. After blending, the resulting fine powder was put in glass bottles containing 200-g. This is the only size available. The mineralogy of the material includes quartz, plagioclase, orthoclase, kaolinite/sericite, amphibole, calcite, muscovite, bornite, chalcopyrite, hematite, apatite, rutile, molybdenite and barite.

INTENDED USE

HV-2 is suitable for use in applications involving the analysis of copper and molybdenum at minor levels. Examples of intended use are for quality control in the analysis of samples of a similar type, method development, arbitration and the calibration of equipment.

INSTRUCTIONS FOR USE

HV-2 should be used “as is”, without pre-treatment. The contents of the bottle should be thoroughly mixed before taking samples. The material can be stored at room temperature and pressure with no special precautions.

HAZARDOUS SITUATION

Normal safety precautions such as the use of safety glasses, breathing protection for fine particulate matter, gloves and a laboratory coat are suggested.

LEVEL OF HOMOGENEITY

Twenty-two bottles of HV-2 were chosen according to a random stratified sampling scheme. Samples of 250 mg were analyzed from two splits taken from each selected bottle. Hydrochloric, nitric, perchloric and hydrofluoric acids were used to digest the samples and the determination of copper and molybdenum was performed using atomic absorption spectroscopy. A one–way analysis of variance technique (ANOVA) was used to assess the homogeneity of these elements (1). The ratio of the between-bottles to within-bottle mean squares is compared to the F statistic at the 95% level of probability. No evidence of inhomogeneity was observed for copper and molybdenum. Further details are available in the certification report. Use of a sample mass smaller than 250 mg will invalidate the statistical parameters contained herein.

CERTIFIED VALUES

Fourteen industrial, commercial, and government laboratories participated in an interlaboratory measurement program. Copper, molybdenum and other elements were analyzed by methods of each laboratory's choice including various acid digestions, fusion, x-ray fluorescence, flame atomic absorption spectroscopy, inductively coupled plasma – optical emission spectroscopy, inductively coupled plasma – mass spectroscopy.

A one-way analysis of variance technique was used to estimate the consensus value and other statistical parameters (1). The two criteria for certification involve the within- and between-laboratories standard deviations and the number of sets with acceptable agreement. Copper and molybdenum were given certified values, which, along with the associated statistical parameters, are indicated in Table 1. Full details of all phases of the work, including statistical analysis, the methods and the names of the participants are contained in CCRMP Report 04-1E.

UNCERTIFIED VALUES

Informational values are listed in Table 2 and are based on the mean of a minimum of two methods and/or two laboratories.

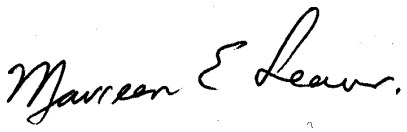
TRACEABILITY
The certified values quoted herein are based on the consensus value derived from the statistical analysis of the data from the interlaboratory measurement program.

DATE OF CERTIFICATION
The first issue of HV-2 was September 2004. The September 2004 version of the certificate was re-issued in January 2010 with no changes due to the expiration of the former.

PERIOD OF VALIDITY
These certified values are valid until January 31, 2032. The stability of the material will be monitored every five years. Updates will be published on the CCRMP web site.

LEGAL NOTICE
CANMET Mining and Mineral Sciences Laboratories (MMSL) has prepared this reference material and statistically evaluated the analytical data of the interlaboratory certification program to the best of its ability. The purchaser, by receipt hereof, releases and indemnifies CANMET - MMSL from and against all liability and costs arising out of the use of this material and information.

CERTIFYING OFFICERS



Joseph Salley | Maureen E. Leaver

FOR FURTHER INFORMATION

CCRMP
CANMET- MMSL (NRCan)
555 Booth Street
Ottawa, Ontario, Canada K1A 0G1
Telephone: (613) 995-4738
Facsimile: (613) 943-0573
E-mail: ccrmp@nrcan.gc.ca

REGFERENCE

1. Brownlee, K.A., Statistical Theory and Methodology in Science and Engineering; John-Wiley and Sons, Inc.; New York; 1960.