CCRMP
Canadian Certified Reference Materials Project

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Projet canadien de matériaux de référence certifiés

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Certificate of Analysis

First issued: 1990 Version: June 2009

RTS-1, RTS-2, RTS-3, RTS-4

SULPHIDE ORE MILL TAILINGS REFERENCE MATERIALS

Table 1a - Summary of Certified Values

	RTS-1	RTS-2	RTS-3	RTS-4
S_{total} %	1.66 ± 0.04	18.95 ± 0.37	9.98 ± 0.26	-
Si, %	19.89 ± 0.46	2.92 ± 0.18	15.99 ± 0.46	-
Ca, %	2.67 ± 0.09	0.53 ± 0.03	2.20 ± 0.09	0.327 ± 0.028
Al, %	4.26 ± 0.15	-	4.79 ± 0.17	-
Mg, %	2.67 ± 0.07	0.351 ± 0.012	2.45 ± 0.06	-
Cu, µg/g	595 ± 18	670 ± 32	2820 ± 90	-
Zn, µg/g	553 ± 31	117 ± 10	1850 ± 80	158 ± 14
Pb, µg/g	-	-	146 ± 20	-
Ni, µg/g	-	2430 ± 100	-	-
Co, µg/g	16.6 ± 3.9	-	260 ± 16	-
As, µg/g	-	-	9.1 ± 2.6	-

Table 1b - Summary of Provisional Values

	RTS-1	RTS-2	RTS-3	RTS-4
S_{total} %	-	-	-	35.9 ± 1.2
$S_{sulphate}$ %	1.26 ± 0.05	3.87 ± 0.027	1.54 ± 0.12	0.27 ± 0.05
Fe, %	19.64 ± 0.71	37.4 ± 1.2	21.04 ± 0.66	56.7 ± 1.8
Si, %	-	-	-	0.998 ± 0.078
Al, %	-	0.83 ± 0.05	-	0.339 ± 0.030
Mg, %	-	-	-	0.179 ± 0.019
Cu, µg/g	-	-	-	280 ± 15
Pb, µg/g	105 ± 18	45 ± 21	-	60 ± 24
Ni, µg/g	22 ± 7	-	71 ± 13	7940 ± 360
Co, µg/g	-	72 ± 7	-	186 ± 21
As, µg/g	8.2 ± 1.6	6.3 ± 1.8	-	207 ± 44

Table 2 - Summary of Informational Values

	RTS-1	RTS-2	RTS-3	RTS-4
$S_{elemental}$ %(1)	0.50 ± 0.16	14.47 ± 0.14	2.81 ± 0.08	0.43 ± 0.03
$S_{sulphide}$ %(2)	0.0 ± 0.07	0.61 ± 0.40	5.63 ± 0.30	35.2 ± 1.2
Fe_{TITR}, %(3)	19.89 ± 0.26	37.90 ± 0.37	21.15 ± 0.15	56.64 ± 0.50
Mn, %	0.19	0.04	0.20	0.015
Na, %	0.50	0.22	0.51	0.07
K, %	0.52	0.12	0.35	0.04
Ti, %	0.40	0.16	0.32	0.08
P, %	0.06	0.02	0.05	0.02
CO_2, %	<0.1	<0.2	<0.2	<0.7
C_{total},%	<0.9	<2	<0.9	<1.5
H_2O^-,%	1.5	1.7	1.8	0.16
Cd, µg/g	2	2	9.1 ± 1.6	5
Ba, µg/g	123	72	98	27
Bi, µg/g	81	3	100	3.3
Cr, µg/g	50	125	75	100
Se, µg/g	40	57	61	100
Sr, µg/g	60	30	40	12
Zr, µg/g	110	20	66	10
Ag, µg/g	<3	<2	<8	<2
Au, ng/g	262 ± 30	38 ± 10	235 ± 23	21 ± 9
Pt, ng/g	<70	217 ± 19	<70	55 ± 36
Pd, ng/g	<20	136 ± 16	<20	15

(1) CANMET values; two sets
(2) Computed by difference from CANMET values.
(3) Sets obtained by volumetric titration only.

Four sulphide ore tailings reference materials were prepared and characterized by the Canadian Certified Reference Materials Project (CCRMP) at the request of the Mine Environment Neutral Drainage Project (MEND) - an industry/government project on reactive acid tailings management.

The materials identified as RTS-1 and RTS-3 were prepared from samples drawn by Noranda Inc. from the oxidized (vadose) zone and the saturated ("unoxidized") zone of the Waite-Amulet tailings, located approximately 20 km north of Noranda, Quebec. RTS-2 is a product provided by INCO Ltd., Sudbury, Ontario, in response to a request for a low pyrrhotite (oxidized) material. RTS-4 is a pyrrhotite concentrate donated by Falconbridge Limited in response to the request for a high pyrrhotite (unoxidized) material from Sudbury.

PREPARATION

RTS-1, RTS-2, and RTS-3 were batch-dried on a steam pipe bed or low-temperature oven. Dried material was crushed in Denver rollers and milled in 30-kg batch lots in a vibration-energy mill. The materials were sieved to -200 mesh, blended in a 540-L conical blender, and bottled in 100-g units in laminated aluminum foil-mylar pouches.

RTS-4 could not be dried conventionally because of thermal decomposition. Instead, a laborious combination of vacuum filtration and acetone washing was employed to produce 27 kg of -200 mesh material. After blending, RTS-4 was bottled in 25-g units which were sealed in laminated aluminum foil-mylar pouches.

MEASUREMENT PROGRAM

A systematic sampling scheme was used to select samples for analytical measurements and homogeneity evaluation. Seventeen laboratories provided triplicate results on two bottles of each material for up to 30 constituents. Certified and provisional values ± 95 % confidence limits for 13 constituents are presented in Tables la and 1b, respectively. Informational values for some 20 other constituents are given in Table II.

CERTIFICATION HISTORY

RTS-1 to RTS-4 were first released in 1990. In 1996 the certificate was re-issued on the new CCRMP letterhead. In 2009 the certificate was re-issued with the certified and provisional values previously shown in Table 1 separated into two Tables, la and lb respectively, for clarity. None of the values have changed since 1990.

LEGAL NOTICE

The Canadian Certified Reference Materials Project (CCRMP) has prepared these reference materials and evaluated the analytical data of the certification program to the best of its ability. The purchaser, by receipt hereof, releases and indemnifies CCRMP from and against all liability and costs arising out of the use of these materials and information.

REFERENCE

A CANMET-MMSL report, CCRMP 90-3E, describing the preparation and certification procedures for these reference materials is available at no charge upon request to:

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