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Level IV Data Package

MWH Group 212263

Method: 7196 CRVI

Sample No.:

2708030231
2708030232
2708030233
2708030234
2708030235

SM 7196A QC Check List Cr-VI

Analyst WBH Analysis date 8/3/07 Reviewer/Date VV 8/6/07

Instrumnet: HACH DR/4000V

✓ All sample analyzed within 24 Hrs. holding time

✓ All sample raw concentraction below the high standard or linear range of this batch
if not, overranged samples marked for dilution and rerun

ALL QC

✓ All calibration verifications within +/- 10%
✓ LCS/LCSD within +/+ 15%
✓ MS/MSD within +/-30%
✓ MRL within +/- 50%
✓ CCV within +/- 10%
✓ CCB/Blank <1/2 MRL
✓ RPD between MS/MSD is within +/-/20%
✓ All pH of the samples are 7

✓ No more than 20 samples per batch

MS is run at frequency of 1 every 10 samples and MSD is
run at frequency of 1 every 20 samples

NA QIR needed for failed QC

Special Det Code noted on the cover sheet

(initials) 3 Aug 07

(initials) 8/13/07

Instrument: Hach DR 4000V		Cr-VI by EPA Method 7196A			
Analyst: Walter Hsieh		Date: 8/3/07	Page 1 of 1	Start time: 11:15	End time: 12:00
Cal. Stock Std:	Use Built-In Curve in	Cal. Stock Std exp. Date: 08/10/2007		Cal. Working Std:	WH070511-1
LCS Stock Std:	HACH DR4000V	LCS Stock Std exp. Date: 08/10/2007		LCS Working Std:	WH070511-2
Correlation Coeff:	—	Slope: —	Y-intercept: —	LCS True Value:	0.05PPM

12:15→13:4

Sample		Dilution sample mls	Dilution total mls	abs	Turb Blk (same dilution) abs	res abs	Calc. mg/L	Reported mg/L	Sampling date	pH	Anal. Time	Comments
Blank		10	10	0.000			0.000	0.000	✓			
Std 1 (0.005 ppm)		10	10	0.010			0.005	0.005	✓			(100)
Std 2 (0.020 ppm)		10	10	0.038			0.020	0.020	✓			(100)
Std 3 (0.050 ppm)		10	10	0.092			0.050	0.050	✓			(100)
Std 4 (0.200 ppm)		10	10	0.360			0.197	0.197	✓			(98.5)
Std 5 (0.500 ppm)		10	10	0.883			0.483	0.483	✓			(96.6)
LCS - 1 (0.05 ppm)		10	10	0.096			0.052	0.052	✓			(104) Limit: 85 - 115%
Sample Log #	Sample ID GW-11	5	10	0.012			0.008	0.016		7	13:52	DUR
1 2708030247	Discharge	1.0	10	0.009			0.005	0.005	8/2	9	11:51	
2 2708030248	West	0.5	10	0.178			0.097	1.94	✓		11:52	
3 2708030248MS	West MS	0.5	10	0.264			0.144	2.88			11:53	2.88-1.94 / 1.0 (94)
4 2708030248MSD	West MSD	0.5	10	0.264			0.145	2.90			11:54	2.90-1.94 / 1.0 (96)
5 2708030249	EAST	0.1	10	0.304			0.166	16.6	✓		11:55	
6 2708030239	GW-11	10	10	0.037			0.020	0.020	✓		11:56	
7 2708010343	EB-2	10	10	0.002			0.002	<0.005	8/1	7	11:57	
8 2708010344	MD-2	5	10				OR					
9 2708010344Dup	MD-2	1	10				OR					
10 2708010342	M12A	0.1	10	0.261			0.143	14.3	✓		11:58	
11 2708010344Dup	MD-2	0.1	10	0.260			0.142	14.2	✓	7	11:59	
12 LCS(0.05)			10	0.092			0.050	0.050	✓		(100)	(100)
13 2708030233	M36	0.5	10	0.350			0.191	38.2	8/2	7	13:32	H1 Time 1107
14 2708030231	M84	10	10	0.165			0.090	0.090	✓		13:33	H3 0945
15 2708030234	M11	0.5	10	0.260			0.142	2.84	✓		13:34	H1 1135
16 2708030235	M10	10	10	0.645			0.350	0.350	✓		13:35	H1 1235
17 2708030232	M100	10	10	0.398			0.218	0.22	✓		13:36	H3 10:30
18 LCS(0.05)			10	0.095			0.052	0.052	✓		(104)	
19 Blk			10	0.000			0.000	0.000				
20 20ppb			10	0.037			0.020	0.020	✓		(100)	
LCS - 2 (0.05 ppm)		10	10	0.093			0.051	0.051	✓		(102)	Limit: 85 - 115%
0.020 ppm/CCV		10	10	0.036			0.020	0.020	✓		(100)	Limit: 90-110%
Blank/CCB		10	10	0.000			0.000	0.000	✓			

F F HF H3

Analytical Reviewed By:	QC Reviewed By:		Color Reagent: HACH Perma Chem Chroma Ver3
Entered By: Walter Hsieh	WH 8/6/07		EXP. Date 09/30/09 Lot # A7045

REV. 02/08/07 wbh

H3 → Sx. Rec'd. Past HT.
all 4 sxs were sampled at 10:00. Fed Ex. Arrived past 10:00 the next day.
(initials) 8/3/07

Standard Preparation Worksheet & Certificate of Analysis

Reagent Preparation Documentation

Reagent: 5ppm Cr6 Std
Date Received/Prepped: 2 1 6 1 0 7 1 / / 1
Date Expired: 5 1 6 1 0 7 1 / / 1
Manufacturer: WBM
Storage Condition: Room Temp

MW #: WM070206-1
By: WBM
Matrix: AQ 1% H_2SO_4
Amount: 100mL
Lot #:

Component	Comment	Standard	Concentration
0.5ml	# ME060403		5ppm

Comment:

Reagent: 5ppm Cr6 QC
Date Received/Prepped: 2 1 6 1 0 7 1 / / 1
Date Expired: 5 1 6 1 0 7 1 / / 1
Manufacturer: WBM
Storage Condition: Room Temp

MW #: WM070206-2
By: WBM
Matrix: AQ 1% H_2SO_4
Amount: 100ml
Lot #:

Component	Comment	Standard	Concentration
0.5ml	R 201081		5ppm

Comment:

Reagent: 5ppm Cr6 CCV Std.
Date Received/Prepped: 5 1 11 1 0 7 1 / / 1
Date Expired: 8 1 10 1 0 7 1 / / 1
Manufacturer: WBM
Storage Condition: Room Temp

MW #: WM070511-1
By: WBM
Matrix: AQ 1% H_2SO_4
Amount: 100ml
Lot #:

Component	Comment	Standard	Concentration
0.5ml	R201632		5ppm

Comment:

Reagent Preparation Documentation

Reagent: Cr16 QC Std.
Date Received/Prepped: 5 / 11 / 07 / / /
Date Expired: 8 / 10 / 8071 / / /
Manufacturer: WSH
Storage Condition: Room Temp

MW #: WH070511-2
By: WSH
Matrix: AQ / 1% H_2SO_4
Amount: 100ml
Lot #:

Component	Comment	Standard	Concentration
Cr 16 0.5ml	RH 201090		5 ppm

Comment:

Reagent: 5 ppm Cr+6 Cal Std
Date Received/Prepped: 8 / 9 / 07 / / /
Date Expired: 11 / 9 / 07 / / /
Manufacturer: FAS
Storage Condition: Room temp

MW #: Fj 080907-1
By: Fj
Matrix: aqeous 1% H_2SO_4
Amount: 100 mL
Lot #:

Component	Comment	Standard	Concentration
Cr+6 0.5 mL	R 201090		5 ppm

Comment:

Reagent: Cr+6 QC std
Date Received/Prepped: 8 / 9 / 07 / / /
Date Expired: 11 / 9 / 07 / / /
Manufacturer: FAS
Storage Condition: Room temp

MW #: Fj 080907-2
By: Fj
Matrix: aqeous 1% H_2SO_4
Amount: 100 mL
Lot #:

Component	Comment	Standard	Concentration
Cr+6 0.5mL	R 201632		5 ppm

Comment:

INORGANIC VENTURES™
195 Lehigh Avenue, Suite 4
Lakewood, New Jersey 08701 - USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 - 732.901.1900
fax: 732.901.1903
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35:1989 "Certification of Reference Materials - General and Statistical Principals."

R# 201632

2.0 **DESCRIPTION OF CRM** **1000 µg/mL Chromium (+6) in H20**

Catalog Number:	CGCR(6)1-1, CGCR(6)1-2, and CGCR(6)1-5
Lot Number:	**Z-CR02152**
Starting Material:	(NH4)2Cr2O7
Starting Material Purity (%):	99.989259
Starting Material Lot No:	F04N14
Matrix:	H20

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 3 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\Sigma x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

· This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1000 ± 3 µg/mL**
Redox NIST SRM 136e Lot Number: 980702

Assay Method #2 **1001 ± 4 µg/mL**
ICP Assay NIST SRM 3112a Lot Number: 990607

4.2 **BALANCE CALIBRATION** - All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.01185	O	Li	< 0.00002	M	Pr	< 0.00059	M	Te	< 0.05923
M	Sb	< 0.00099	M	Er	< 0.00987	M	Lu	< 0.00079	M	Re	< 0.00197	M	Tb	< 0.00059
M	As	< 0.01974	M	Eu	< 0.00592	O	Mg	< 0.00030	M	Rh	< 0.00197	M	Tl	< 0.00197
M	Ba	< 0.01974	M	Gd	< 0.00197	M	Mn	< 0.00790	M	Rb	< 0.00197	M	Th	< 0.00197
M	Be	< 0.00099	M	Ga	< 0.00197	O	Hg	< 0.01500	M	Ru	< 0.00395	M	Tm	< 0.00079
M	Bi	< 0.00079	M	Ge	< 0.01185	M	Mo	< 0.00395	M	Sm	< 0.00197	M	Sn	< 0.00987
O	B	< 0.01000	M	Au	< 0.00592	M	Nd	< 0.00395	M	Sc	< 0.01974	O	Ti	< 0.00100
M	Cd	< 0.00592	M	Hf	< 0.00395	M	Ni	< 0.01579	M	Se	< 0.01579	M	W	< 0.01974
O	Ca	0.00027	M	Ho	< 0.00099	M	Nb	< 0.00099	O	Si	< 0.20000	M	U	< 0.00395
M	Ce	< 0.00987	M	In	< 0.01974	n	Os		M	Ag	< 0.00395	O	V	< 0.02000
M	Cs	< 0.00059	M	Ir	< 0.00987	M	Pd	< 0.00987	O	Na	0.00300	M	Yb	< 0.00197
s	Cr		O	Fe	< 0.01000	O	P	< 0.04000	M	Sr	< 0.00099	M	Y	< 0.07897
M	Co	< 0.00592	M	La	< 0.00099	M	Pt	< 0.00395	i	S		O	Zn	< 0.00400
M	Cu	< 0.01185	M	Pb	< 0.00592	O	K	0.32485	M	Ta	< 0.01382	M	Zr	< 0.00987

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 51.9961; +3; 6; $Cr_2O_7^{2-}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals (Except Ba and Pb) and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container as *Total* Cr, however, the stability of this oxidation state is unknown. 1-10,000 ppm solutions chemically stable for years in 0 - 1% HNO_3 / LDPE container.

Cr Containing Samples (Preparation and Solution) - Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used:

A. Fusion with $KHSO_4$ and extraction with hot KCl. The residue fused with Na_2CO_3 and $KClO_3$, 3:1.
B. Fusion with $NaKSO_4$ and NaF, 2:1.
C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1.
D. Fusion with Na_2O_2 or NaOH and KNO_3 or NaOH and Na_2O_2.

Nickel, iron, copper, or silver crucibles should be used for **D**. Platinum may be used for **A, B and C**);
Organic Matrices (Ash at 450EC followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions may be applicable to **non oxide** containing samples) .

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 205.552 nm	0.006 / 0.0008 µg/mL	1	ion	Os
ICP-OES 284.325 nm	0.008 / 0.0007 µg/mL	1	ion	
ICP-OES 276.654 nm	0.01 / 0.001 µg/mL	1	ion	Cu, Ta, V
ICP-MS 52 amu	40 ppt	n/a	M+	36S16O, 36Ar16O - The 50Cr, 53Cr, 54Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to an in house procedure and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 06, 2006

Expiration Date: EXPIRES 01/2008

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, Product Documentation Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Senior Technical Director