February 20, 2012

Joe Cerniglia
The International Group for Historic Aircraft Recovery (TIGHAR)

Subject: ICP-MS Report
Job Number: S0CHG688

Dear Joe:

Please find enclosed the procedure report for the analysis of your samples.

Thank you for using the analytical services of the Evans Analytical Group - NY. We appreciate your business and welcome any suggestions you may have for improving the quality and efficiency of our service. Please do not hesitate to call us if you have any questions regarding this report.

Sincerely,

Manager ICP, IGA and TG Services
(Tel. 315-431-9900; risensee@eaglabs.com)

Enclosures:

ICP-MS REPORT
JOB NUMBER: S0CHG688

for

Joe Cerniglia
The International Group for Historic Aircraft Recovery (TIGHAR)
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Analyzed by:

Gabriel Infantino
Group Leader
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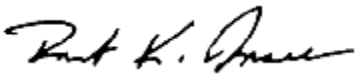
Reviewed by:



Robert K Isensee
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Evans Analytical Group
6707 Brooklawn Parkway
Syracuse, NY 13211, USA

Purpose:
To determine the composition of one glass sample.

ICP-MS Method:
Aqueous samples are aspirated and converted to an aerosol through a nebulizer and directed into an argon based plasma. Here the sample is dried, vaporized, atomized and ionized in the argon plasma. The resulting ions are then directed into a quadrupole mass analyzer where they are then separated and measured according to their mass to charge ratios. The constituents of an unknown sample can then be identified and quantified. ICP-MS offers extremely high sensitivity to a wide range of elements.

Analytical Set-up: ICPMS
Instrument: Perkin Elmer Elan DRC II equipped with a Cetac ASX-520 auto sampler.

ICP-MS conditions	
Instrument	ELAN DRC II
Nebulizer	Quartz Meinhardt
Spray Chamber	Cyclonic
RF power	1350 W
Ar Flow	15.0 L/min
Auxillary Ar Flow	1.2 L/min
Nebulizer Gas Flow	0.88 L/min
Integration time	80 S
Scanning mode	Peak hopping
Replicates	2
RPq for Cerium as CeO (m/z 156)	< 2 %

Procedure:
For this test total digestion of the glass was preformed to determine the elements present in the bulk material. This test involved the use trace metals grade acids and high purity water. Reagent information, manufacturer and lot numbers are listed below:

Nitric Acid - ARISTAR PLUS - trace metal grade - Lot number 1112074
Hydrochloric Acid - ARISTAR PLUS - trace metal grade - Lot number 4112030
Hydrofluoric Acid - Fisher - trace metal grade – Lot number 5111093
Aqua Regia - mix of hydrochloric and nitric trace metal acids in a 3:1 ratio
High Purity Water - 18.2MΩ*cm, deionized water

The sample digestion was accomplished using an Anton Paar multiwave 3000 microwave digestion unit. This allows for digestion in a closed environment under high temperature and pressure with minimum loss of volatile elements. To perform the digestion one small area was chipped off from the outer side of the sample near its base. The area was chipped off using a file covered in acid cleaned parafilm. The sample itself was also covered in acid cleaned parafilm except for the area to be chipped from. A small amount of force was used against the file to chip the area away. Once free the area was separated into smaller pieces, rinsed in high purity water, dried and weighed out for microwave digestion. This digestion involved a 1:1 combination of nitric and hydrochloric acids along with 0.5ml of hydrofluoric acid. An acid blank was also taken through the digestion process with the purpose to correct for background and possible interferences. The sample was digested in duplicate to ensure sample homogeneity. Each sample replicate digestion used approximately 100mg of material.

All elements were calibrated using NIST traceable multielement standards keeping a minimum calibration coefficient criteria of 0.999. Quality control standards were run at the start, finish and periodically throughout the runs with a minimum acceptance criteria of ± 10%.

Results:
Table 1 shows the results of the compositional analysis for the glass sample S0CHG688. Table 2 shows a comparison of compositional analysis between job S0CHG688 (present sample) and job S0CGF653.

Table 1. Compositional results of glass sample S0CHG688.

Element	Mass Fraction (ppm wt)	Element	Mass Fraction (ppm wt)
Li	< 1	**In**	< 1
Be	< 1	**Sn**	< 1
B	2	**Sb**	< 1
Na2O	11.7 wt%	**Te**	< 1
MgO	2.4 wt%	**Cs**	< 1
Al2O3	0.85 wt%	**BaO**	0.37 wt%
SiO2	Matrix	**La**	< 1
P	< 10	**Ce**	< 1
K2O	980	**Pr**	< 1
CaO	3.6 wt%	**Nd**	< 1
Sc	< 1	**Sm**	< 1
Ti	61	**Eu**	< 1
V	< 1	**Gd**	< 1
Cr	< 1	**Tb**	< 1
Mn	6	**Dy**	< 1
Fe	230	**Ho**	< 1
Co	< 1	**Er**	< 1
Ni	< 1	**Tm**	< 1
Cu	< 1	**Yb**	< 1
Zn	4	**Lu**	< 1
Ga	< 1	**Hf**	< 1
Ge	< 1	**Ta**	2
As	< 1	**W**	19
Se	< 1	**Re**	< 1
Rb	3	**Os**	< 1
Sr	31	**Ir**	< 1
Y	< 1	**Pt**	< 1
Zr	36	**Au**	< 1
Nb	< 1	**Hg**	< 1
Mo	< 1	**Tl**	< 1
Ru	< 1	**Pb**	2
Rh	< 1	**Bi**	< 1
Pd	< 1	**Th**	9
Ag	< 1	**U**	< 1
Cd	< 1		

Table 2. Compositional comparison between jobs S0CHG688 and S0CGF653.

S0CHG688

Element	Mass Fraction (ppm wt)	Element	Mass Fraction (ppm wt)
Li	< 1	In	< 1
Be	< 1	Sn	< 1
B	2	Sb	< 1
Na2O	11.7 wt%	Te	< 1
MgO	2.4 wt%	Cs	< 1
Al2O3	0.85 wt%	BaO	0.37 wt%
SiO2	Matrix	La	< 1
P	< 10	Ce	< 1
K2O	980	Pr	< 1
CaO	3.6 wt%	Nd	< 1
Sc	< 1	Sm	< 1
Ti	61	Eu	< 1
V	< 1	Gd	< 1
Cr	< 1	Tb	< 1
Mn	6	Dy	< 1
Fe	230	Ho	< 1
Co	< 1	Er	< 1
Ni	< 1	Tm	< 1
Cu	< 1	Yb	< 1
Zn	4	Lu	< 1
Ga	< 1	Hf	< 1
Ge	< 1	Ta	2
As	< 1	W	19
Se	< 1	Re	< 1
Rb	3	Os	< 1
Sr	31	Ir	< 1
Y	< 1	Pt	< 1
Zr	36	Au	< 1
Nb	< 1	Hg	< 1
Mo	< 1	Tl	< 1
Ru	< 1	Pb	2
Rh	< 1	Bi	< 1
Pd	< 1	Th	9
Ag	< 1	U	< 1
Cd	< 1		

S0CGF653

Element	Mass Fraction (ppm wt)	Element	Mass Fraction (ppm wt)
Li	3	In	< 1
Be	< 1	Sn	7
B	< 1	Sb	< 1
Na2O	13.1 wt%	Te	< 1
MgO	4.3 wt%	Cs	< 1
Al2O3	0.74 wt%	BaO	0.74 wt%
SiO2	Matrix	La	< 1
P	35	Ce	3
K2O	0.24 wt%	Pr	< 1
CaO	8.5 wt%	Nd	< 1
Sc	< 1	Sm	< 1
Ti	100	Eu	< 1
V	6	Gd	< 1
Cr	< 1	Tb	< 1
Mn	11	Dy	< 1
Fe	340	Ho	< 1
Co	< 1	Er	< 1
Ni	< 1	Tm	< 1
Cu	< 1	Yb	< 1
Zn	16	Lu	< 1
Ga	< 1	Hf	< 1
Ge	< 1	Ta	39
As	< 1	W	38
Se	< 1	Re	< 1
Rb	13	Os	< 1
Sr	94	Ir	< 1
Y	< 1	Pt	< 1
Zr	89	Au	< 1
Nb	< 1	Hg	89
Mo	< 1	Tl	< 1
Ru	< 1	Pb	7
Rh	< 1	Bi	< 1
Pd	< 1	Th	< 1
Ag	< 1	U	< 1
Cd	< 1		