APPENDIX C
COUPON DPM PROCESS DOCUMENTATION

Aging Landing Gear Life Extension Program
M-E-39035-112-10000-19

MEMORANDUM

To: Don Roxby, RVSI
From: John Coates, MGB
Date: March 7, 2003
Subject: Statement of Work for RVSI CI Acuity Matrix, Symbology Research Center
Marking Coupons for DPM Evaluation for the NCMS Retrograde Parts Identification Project

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Background

Under the ALGLE Program, testing will be conducted for OO-ALC/LGHLEN to evaluate the survivability of marks applied with direct part marking (DPM) processes for normal aircraft landing gear part overhaul conditions (NALGPOC). The marking for the testing will be conducted under the NCMS Retrograde Parts Identification Project. Based on results from previous testing, laser engraving, dot peening, and micro milling were selected for further testing. The further testing is to evaluate mark improvements. Specifically the mark cells must have radii to reduce stress concentration and tapered sides to reduce clogging.

Mark and Deliver

1. Mark Optimization*
   - 1.1 Determine the optimum process controls for each marking process that provides a mark with no material property degradation and overhaul process survivability. Determine the optimum process controls for each marking process by producing marks using different process controls on coupons S1A-01 to S1A-04 and coupons A1A-01 to A1A-04.
   - 1.2 Use the optimum process controls for each marking process to mark the remaining coupons.
2. Steel Coupons*
   - 2.1 Mark and deliver coupons S1A-17 to S1A-20 in accordance with drawing S1A REV D requirements.
   - 2.2 Mark and deliver coupons S2A-07 to S2A-10 in accordance with drawing S2A REV D requirements.
3. Aluminum Coupons*
   - 3.1 Mark and deliver coupons A1A-17 to A1A-20 in accordance with drawing A1A REV D requirements.
   - 3.2 Mark and deliver coupons A2A-07 to A2A-10 in accordance with drawing A2A REV D requirements.

* For each marking process, provide appropriate mark masking to ensure that the marking process does not interfere or damage previously applied marks.

* RVSI will not mark the coupons with VibroPeen or Steel Stamp.

Documentation

1. Provide documentation for the marking processes. (2 Page Maximum)
   - 1.1 Documentation of the optimum process controls for each marking process.
   - 1.2 Mark verification for each mark.
   - 1.3 Explanations of any anomalies.

Handling and Packaging

1. Coat coupons in light oil between the marking processes and before delivery to prevent corrosion.

Schedule

1. Delivery by March 31, 2003

Contacts

MGB: Engineering	Mr. John Coates	Phone: (801) 825-9443 EXT 110
RVSI: Research and Development	Mr. Don Roxby	Phone: (256) 830-8123

TABLE III: MARK REQUIREMENTS

1. DEEP LASER ENGRAVE MARKS IN DETAIL III PER NASA-HDBK-6003 (P027)
2. DOT PEEN MARKS IN DETAIL III PER NASA-HDBK-6003 (P027)
3. MICRO MILL MARKS IN DETAIL III PER NASA-HDBK-6003 (P027)
4. VIBROPEEN MARKS IN DETAIL III PER OO-ALC/MANPP PROCEDURE
5. IMPRESSION STAMP MARKS IN DETAIL III PER OO-ALC/MANPP PROCEDURE

6 – 10 NOT APPLICABLE

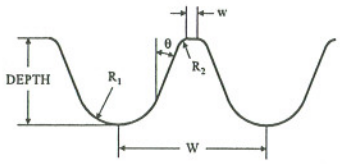
DETAIL III: NOTES AND CELL DETAIL

III.1 LINES AND BOXES INDICATE LOCATIONS FOR MARKS

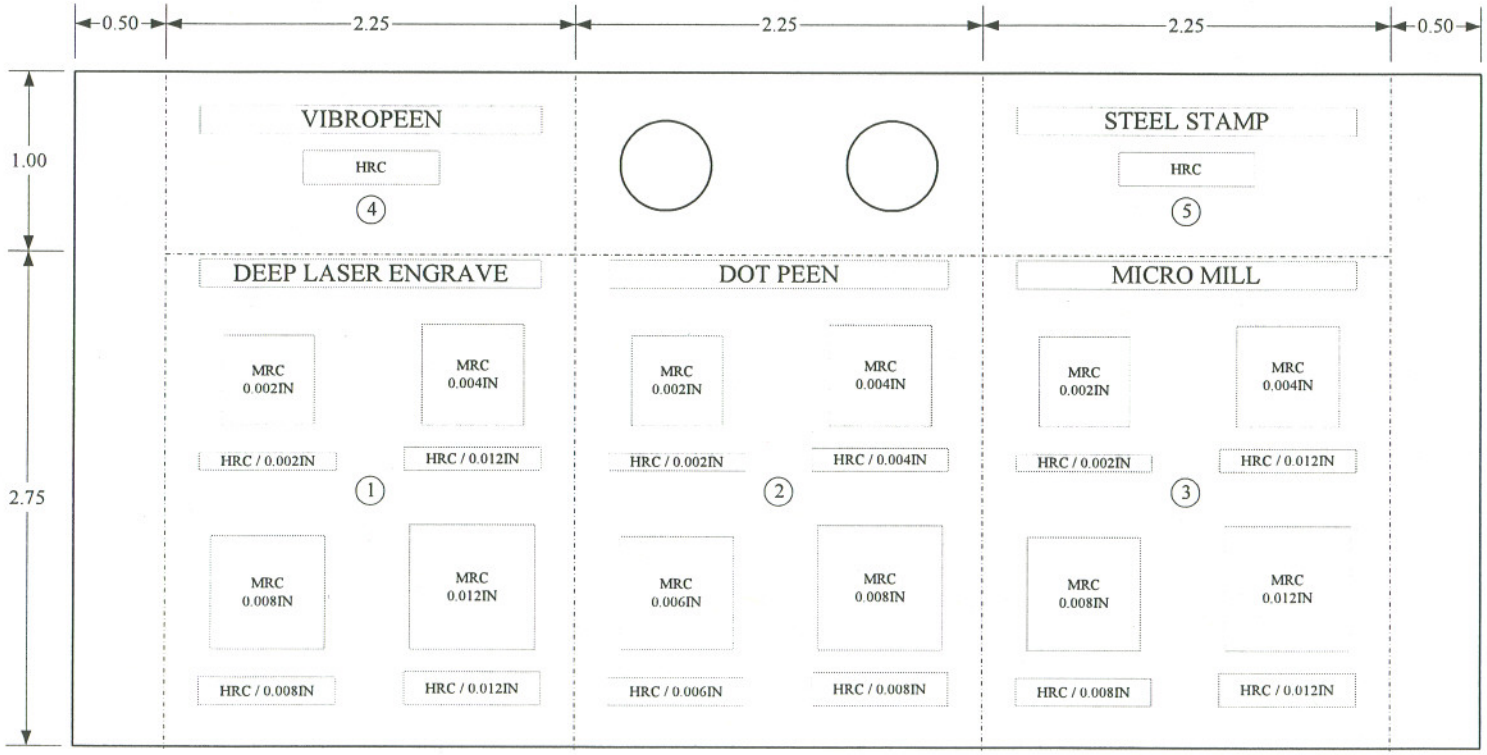
III.2 MRC / MACHINE READABLE CODE: 22 X 22 DATA MATRIX / DEPTH INDICATED IN BOXES

III.3 HRC / HUMAN READABLE CODE: 10 NUMBERS / DEPTH INDICATED IN BOXES
EACH HRC SHALL BE A DIFFERENT RANDOM NUMBER

III.4 MRC AND HRC CELLS SHALL INCLUDE RADII AND TAPERS AS SHOWN



DETAIL III: FIGURE



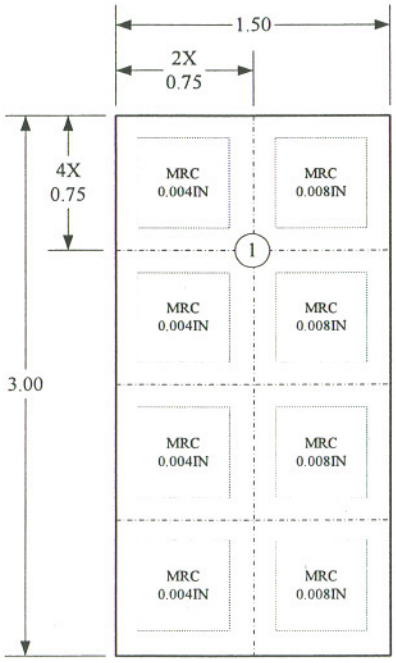
ALGLE PROGRAM	TITLE COUPON	DRAWING NUMBER S1A	REVISION D	DIMENSIONS ALL DIMENSIONS IN INCHES	TOLERANCES UNLESS OTHERWISE NOTED X.X = ± 0.1 X.XX = ± 0.05 ANGLES = ± 0.5°	DRAWN JOHN COATES
DPM EVALUATION	MATERIAL 4340 PER AMS 6415	DATE 2/28/03	SHEET 4 OF 4	SCALE NOT TO SCALE		CHECKED FRANK ZUECH

TABLE II: MARK REQUIREMENTS

(1) DEEP LASER ENGRAVE MARKS IN DETAIL II PER NASA-HDBK-6003 (P027)

(2) – (10) NOT APPLICABLE

DETAIL II: FIGURE

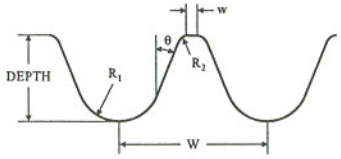


DETAIL II: NOTES AND CELL DETAIL

III.1 LINES AND BOXES INDICATE LOCATIONS FOR MARKS

III.2 MRC / MACHINE READABLE CODE: 18 X 18 DATA MATRIX / DEPTH INDICATED IN BOXES

III.3 MRC CELLS SHALL INCLUDE RADII AND TAPERS AS SHOWN



ALGLE PROGRAM	TITLE COUPON	DRAWING NUMBER S2A	REVISION D	DIMENSIONS ALL DIMENSIONS IN INCHES	TOLERANCES UNLESS OTHERWISE NOTED X.X = ± 0.1 X.XX = ± 0.05 ANGLES = ± 0.5°	DRAWN JOHN COATES
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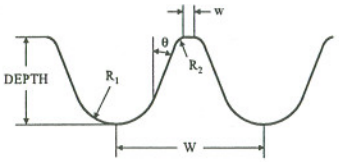
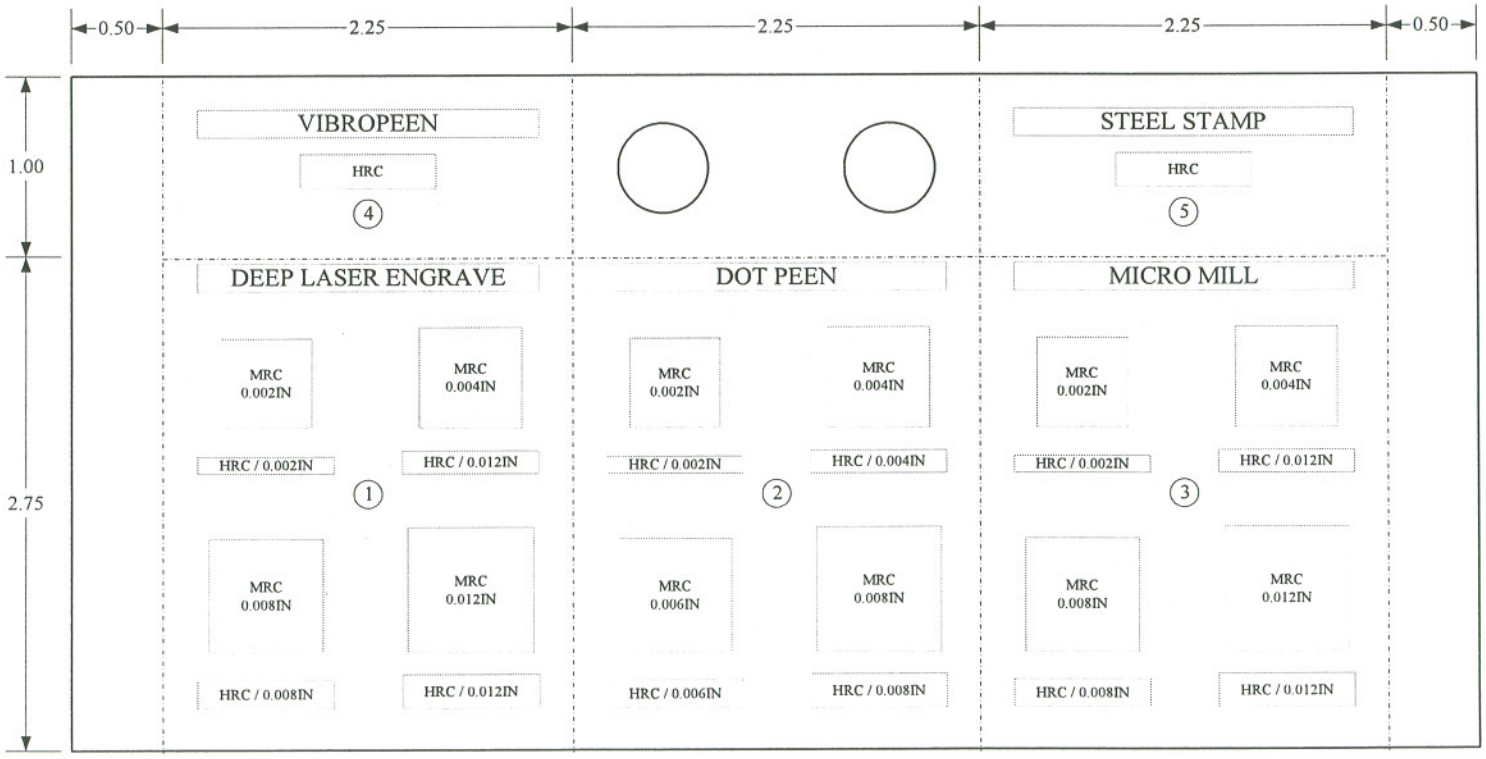


DETAIL III: FIGURE



ALGLE PROGRAM	TITLE COUPON	DRAWING NUMBER A1A	REVISION D	DIMENSIONS ALL DIMENSIONS IN INCHES	TOLERANCES UNLESS OTHERWISE NOTED X.X = ± 0.1 X.XX = ± 0.05 ANGLES = ± 0.5°	DRAWN JOHN COATES
DPM EVALUATION	MATERIAL 7075-T7351 PER AMS 4078 (0.5 INCH PLATE)	DATE 2/28/03	SHEET 4 OF 4	SCALE NOT TO SCALE		CHECKED FRANK ZUECH

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(1) DEEP LASER ENGRAVE MARKS IN DETAIL II PER NASA-HDBK-6003 (P027)

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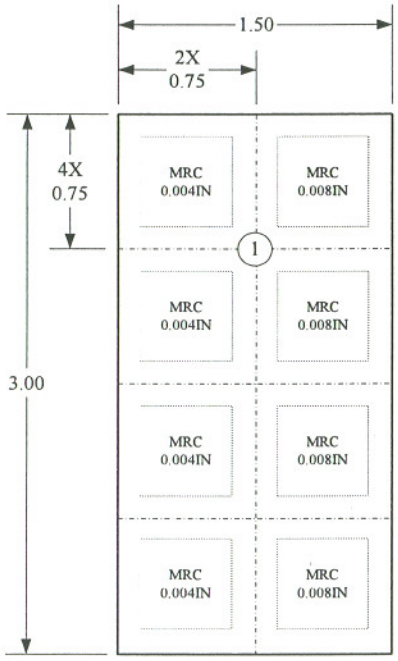
DETAIL II: FIGURE



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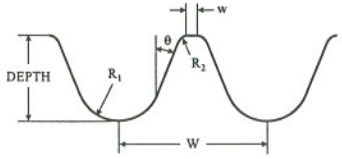


ALGLE PROGRAM	TITLE	DRAWING NUMBER	REVISION	DIMENSIONS	TOLERANCES	DRAWN
	COUPON	A2A	D	ALL DIMENSIONS IN INCHES	UNLESS OTHERWISE NOTED	JOHN COATES
DPM EVALUATION	MATERIAL 7075-T7351 PER AMS 4078 (0.5 INCH PLATE)	DATE 2/28/03	SHEET 3 OF 3	SCALE NOT TO SCALE	X.X = ± 0.1 X.XX = ± 0.05 ANGLES = ± 0.5°	CHECKED FRANK ZUECH

APPENDIX D
COUPON PROCESS DOCUMENTATION

Process Data Sheet: Coupon S2A-07 and S2A-08

Process		Date	Witness
1. Abrasive Blast per MIL-STD-1504 – Glass Bead (10X)	30 PSI	8/4/2003	JC
2. Abrasive Blast per MIL-STD-1504 – Garnet (10X)	60 PSI	8/4/2003	JC

Comments:
- GLASS BLAST AT LEAST ONE 0.004 IN. AND ONE 0.008 IN. MARK
- GARNET BLAST AT LEAST ONE 0.004 IN. AND ONE 0.008 IN MARK
- MASK ALL OTHER MARKS

Process Data Sheet: Coupon A2A-07 and A2A-08

Process		Date	Witness
1. Abrasive Blast per MIL-STD-1504 – Glass Bead (10X)	30 PSI	8/4/2003	JC

Comments:
- GLASS BLAST AT LEAST ONE 0.004 IN. AND ONE 0.008 IN. MARK
- MASK ALL OTHER MARKS

APPENDIX E
COUPON MARK MICROSCOPY DOCUMENTATION
SEM IMAGES
OPTICAL IMAGES

COUPON S2A

Deep Laser Engrave Mark

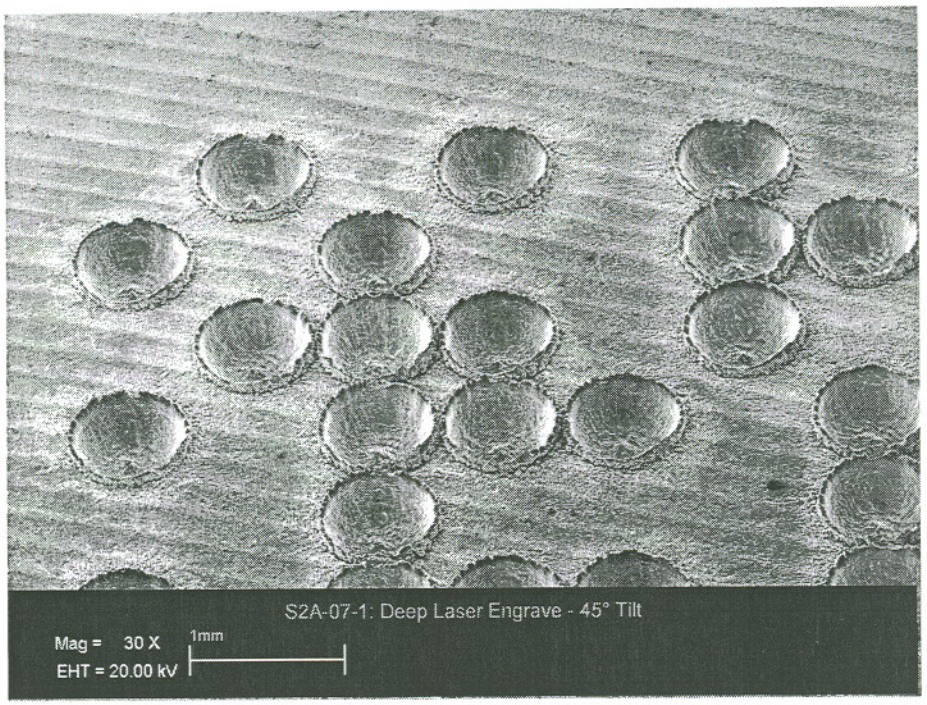


Figure S2A.1.1: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark - 45° Tilt (~30X)

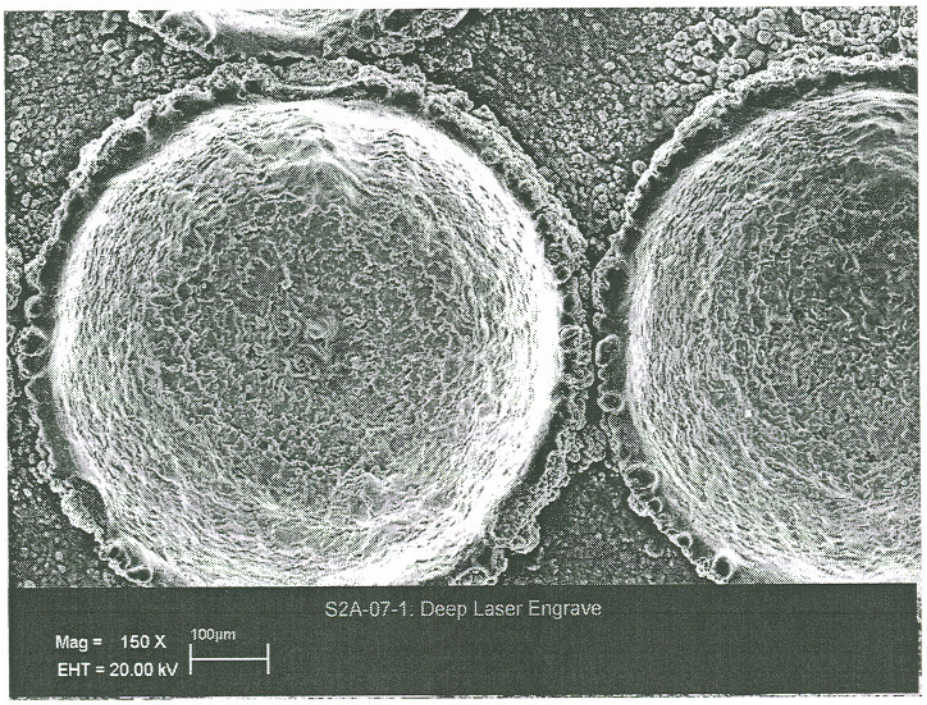


Figure S2A.1.2: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark (~150X)

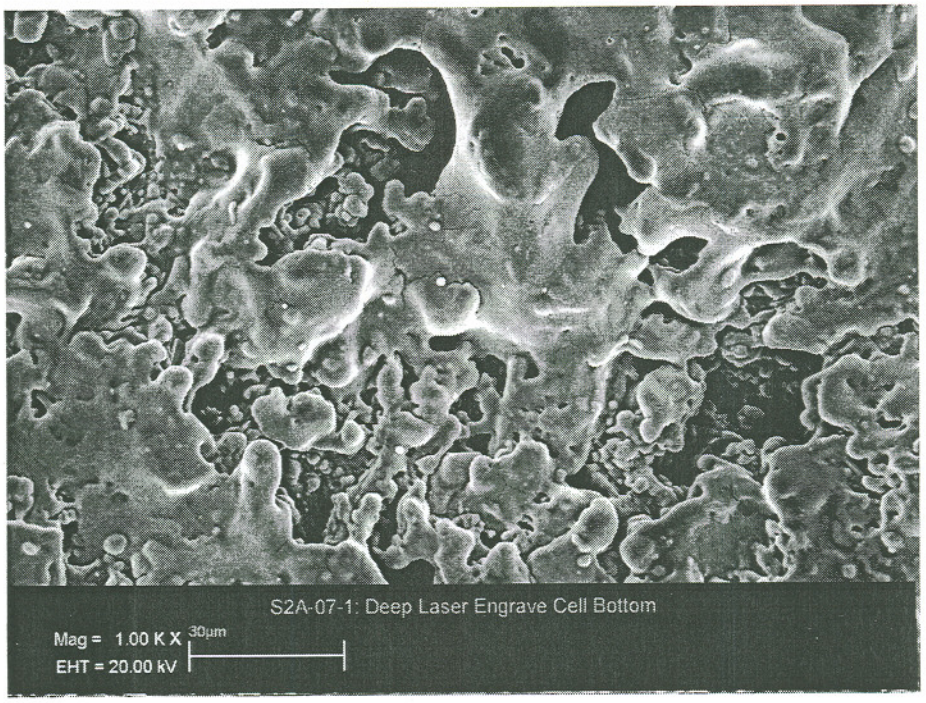


Figure S2A.1.3: SEM Surface Image of Deep Laser Engrave Cell Bottom
Deep Laser Engrave Mark (~1000X)

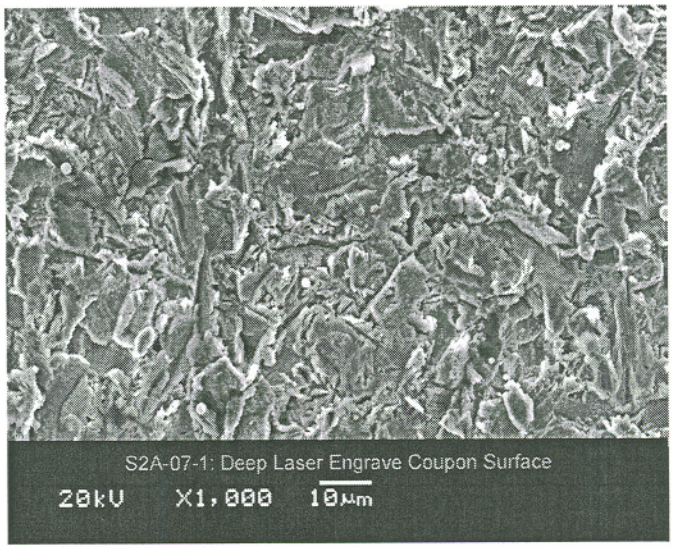


Figure S2A.1.4: SEM Surface Image of Coupon Surface
Deep Laser Engrave Mark (~1000X)

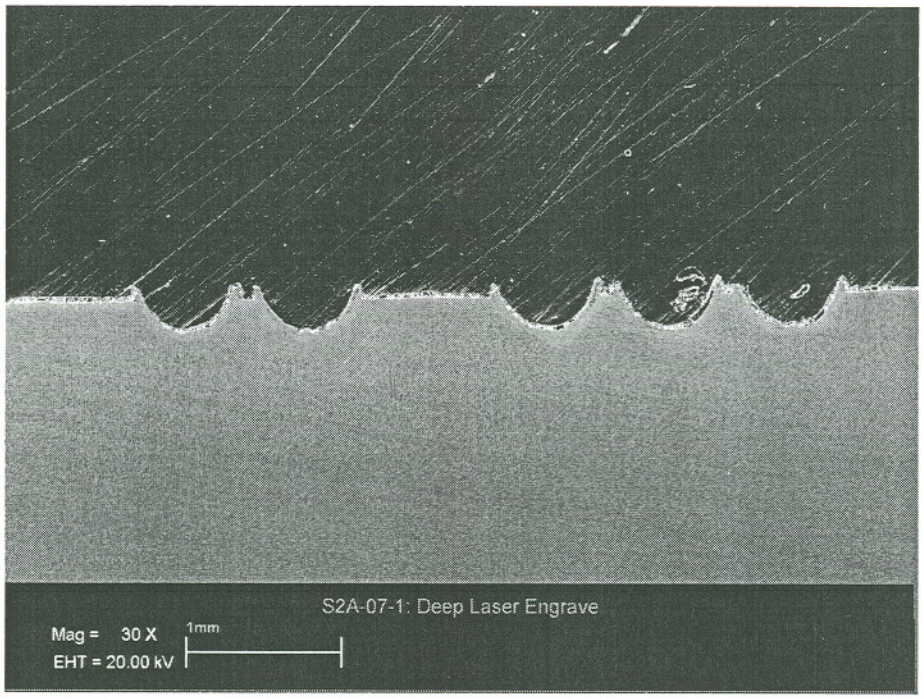


Figure S2A.1.5: SEM Cross Section Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark (~30X)

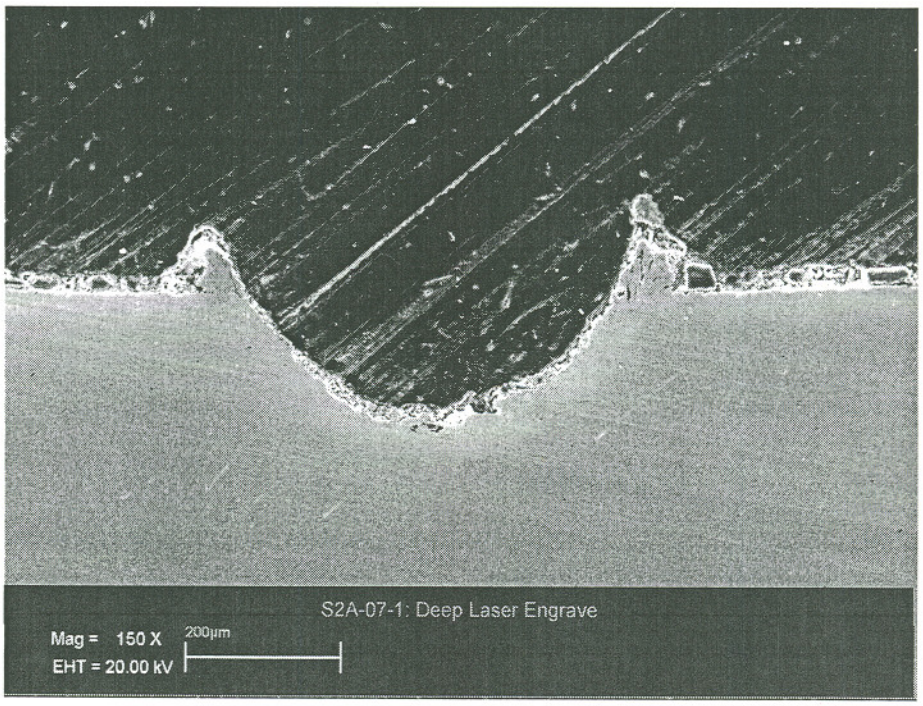


Figure S2A.1.6: SEM Cross Section Image of Deep Laser Engrave Cell
Deep Laser Engrave Mark (~150X)

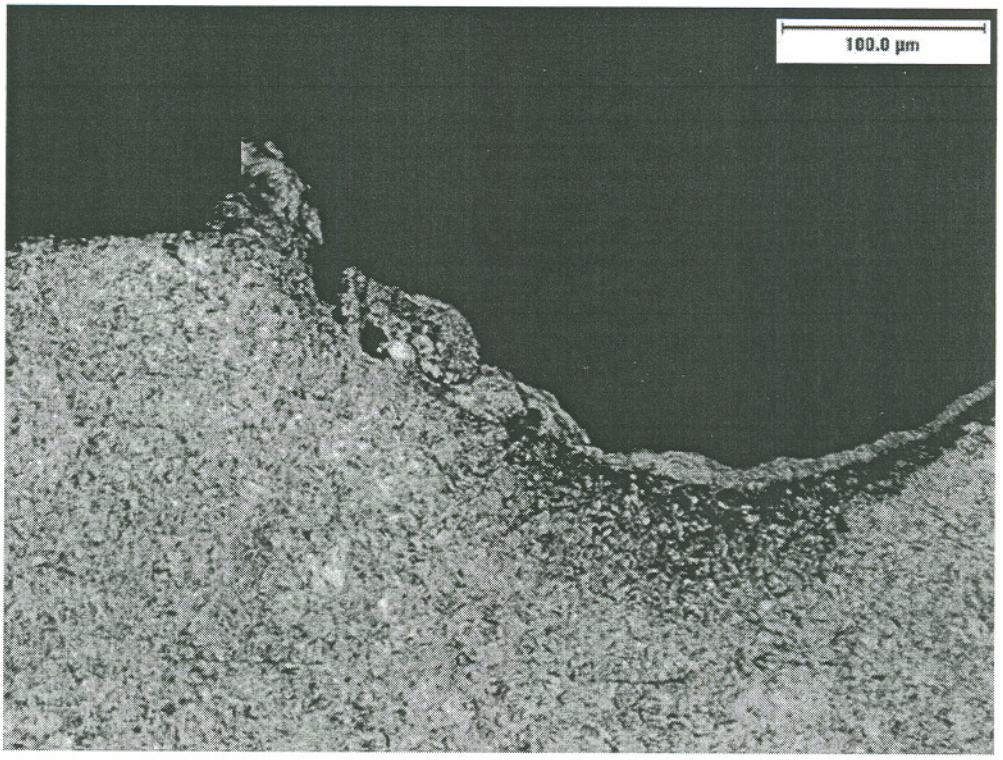


Figure S2A.1.7: Optical Cross Section Image of Etched Deep Laser Engrave Cell
Deep Laser Engrave Mark

Deep Laser Engrave Mark After Glass Blast

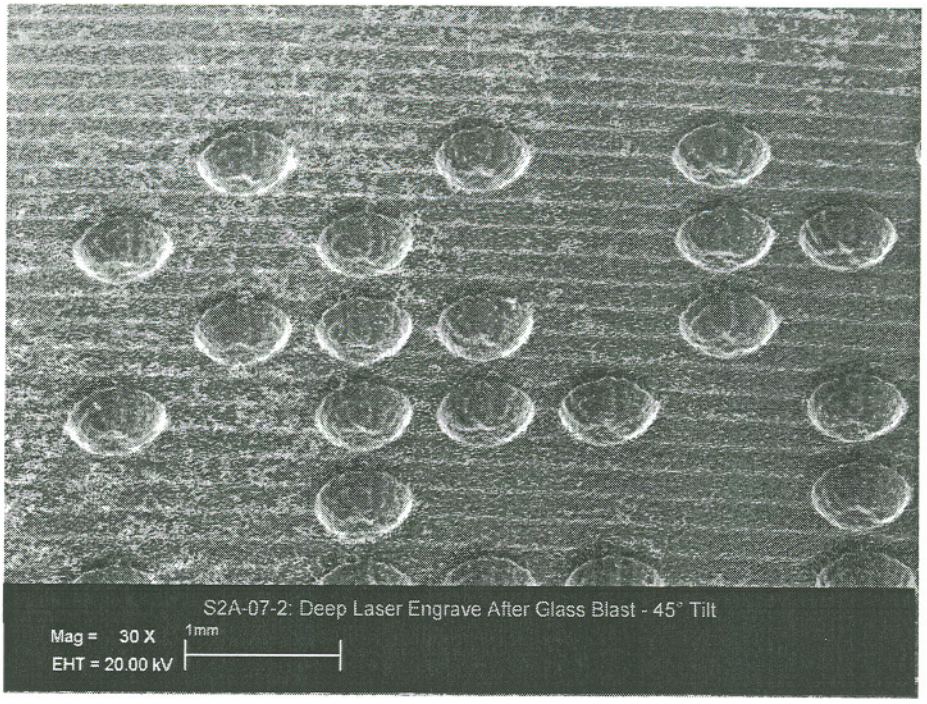


Figure S2A.2.1: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Glass Blast - 45° Tilt (~30X)

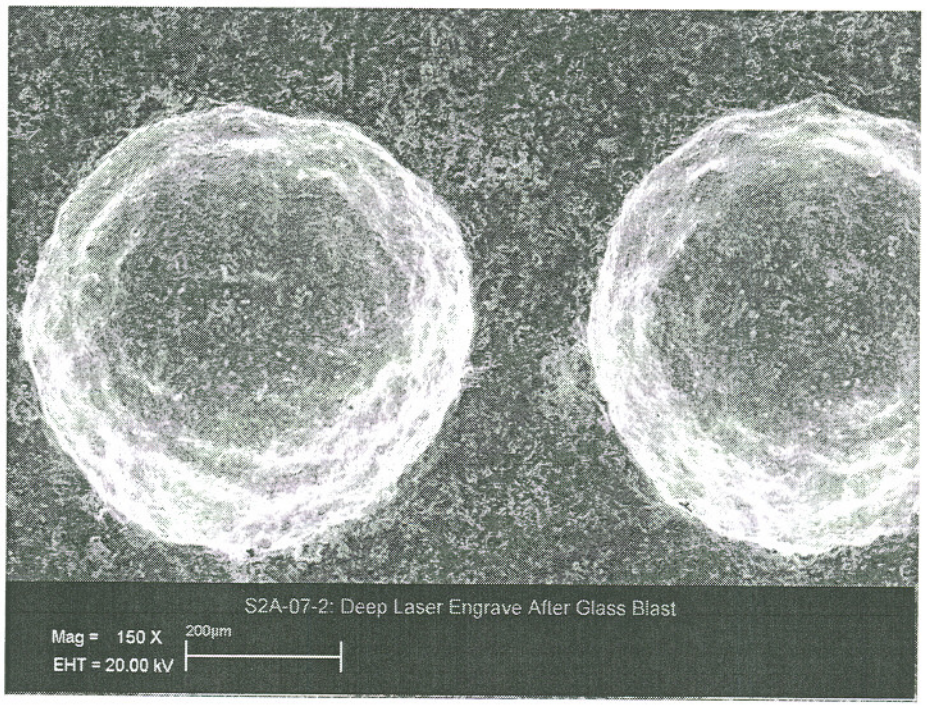


Figure S2A.2.2: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Glass Blast (~150X)

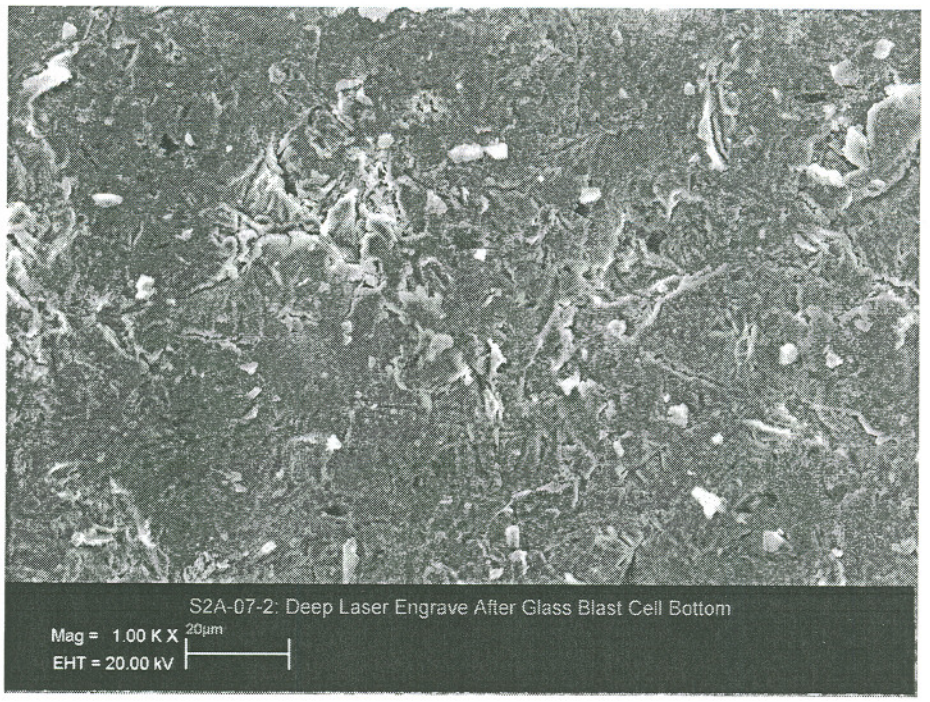


Figure S2A.2.3: SEM Surface Image of Deep Laser Engrave Cell Bottom
Deep Laser Engrave Mark After Glass Blast (~1000X)

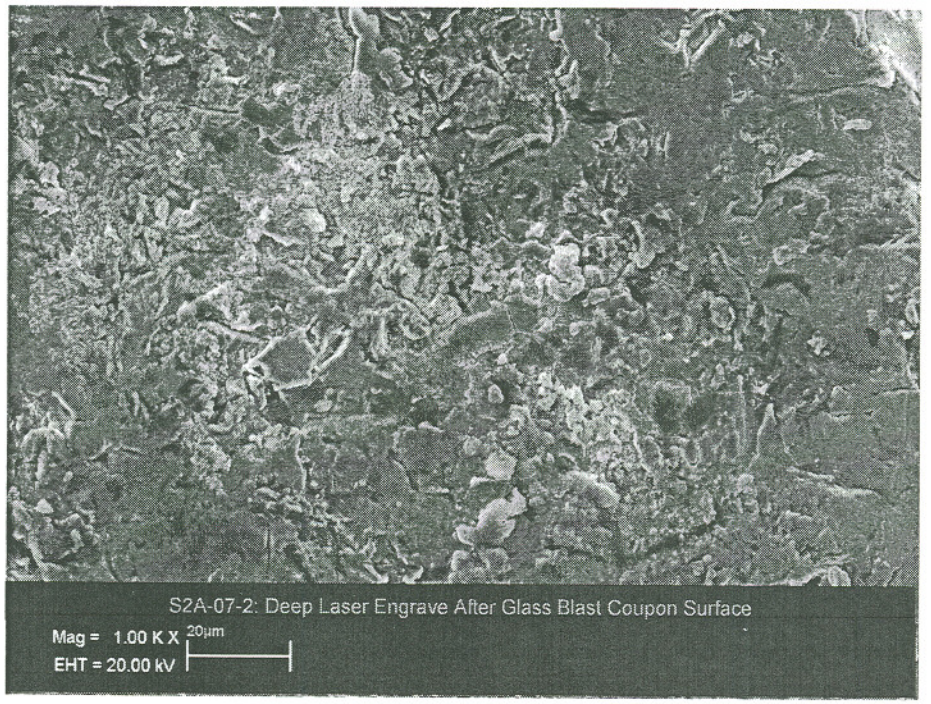


Figure S2A.2.4: SEM Surface Image of Coupon Surface
Deep Laser Engrave Mark After Glass Blast (~1000X)

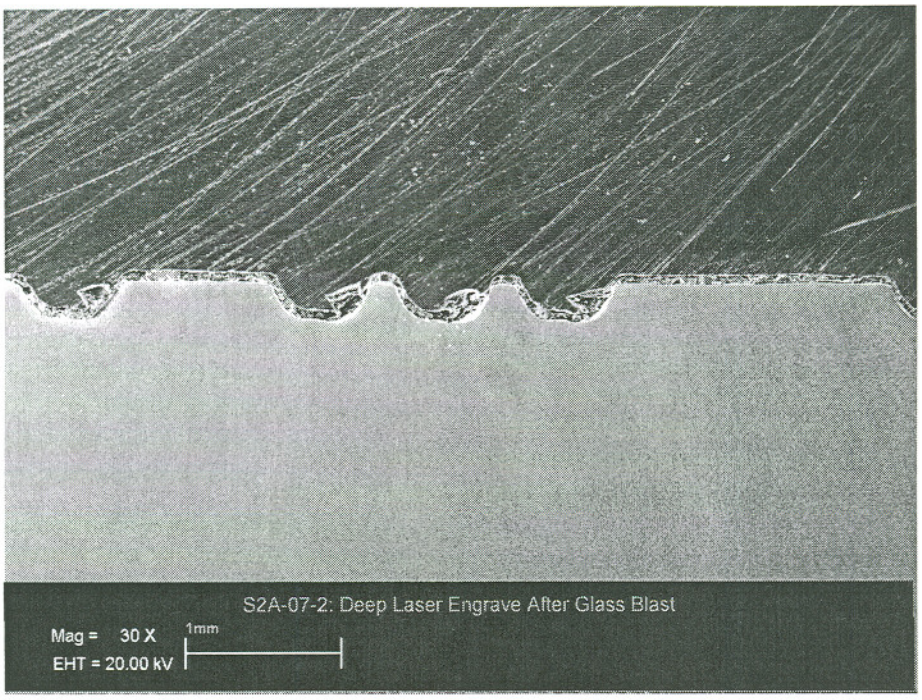


Figure S2A.2.5: SEM Cross Section Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Glass Blast (~30X)

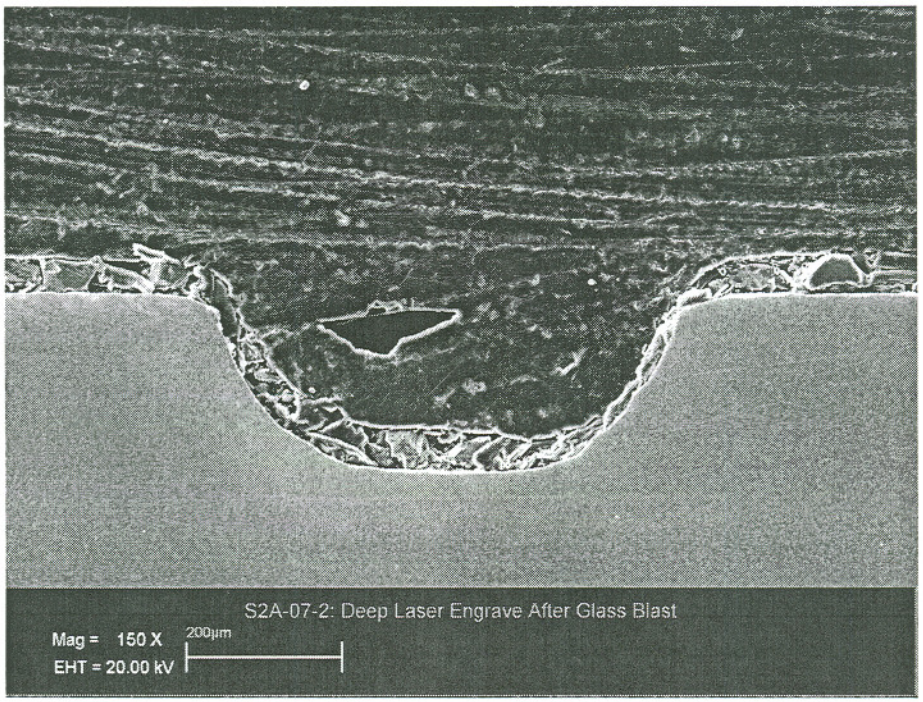


Figure S2A.2.6: SEM Cross Section Image of Deep Laser Engrave Cell
Deep Laser Engrave Mark After Glass Blast (~150X)

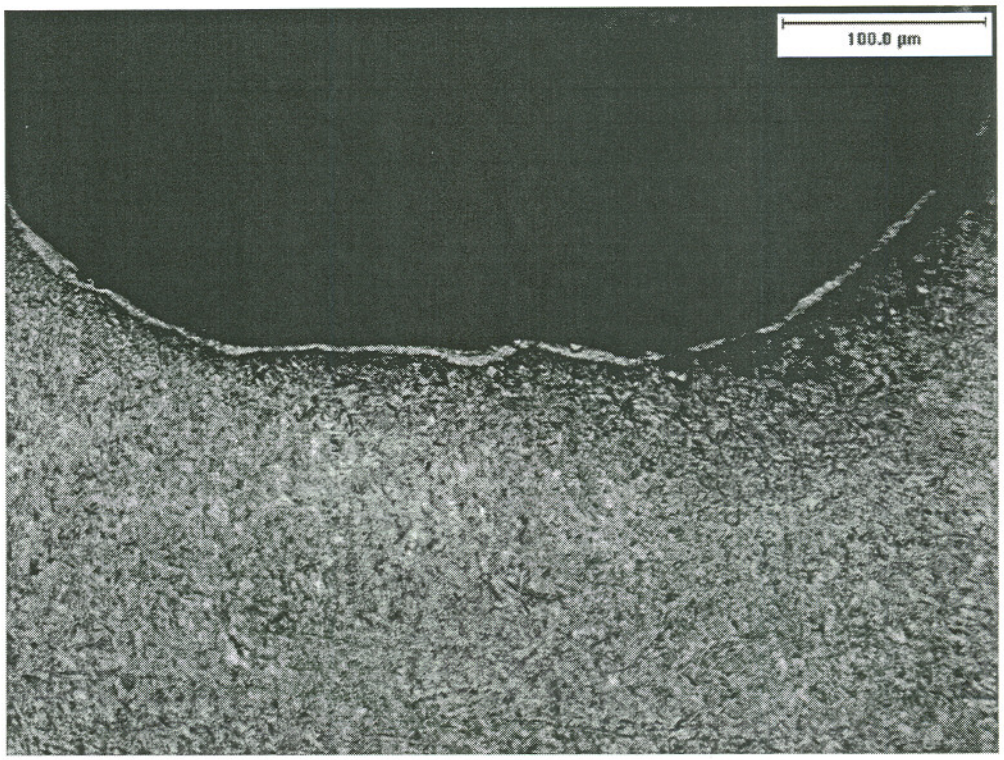


Figure S2A.2.7: Optical Cross Section Image of Etched Deep Laser Engrave Cell
Deep Laser Engrave Mark After Glass Blast

Deep Laser Engrave Mark After Garnet Blast

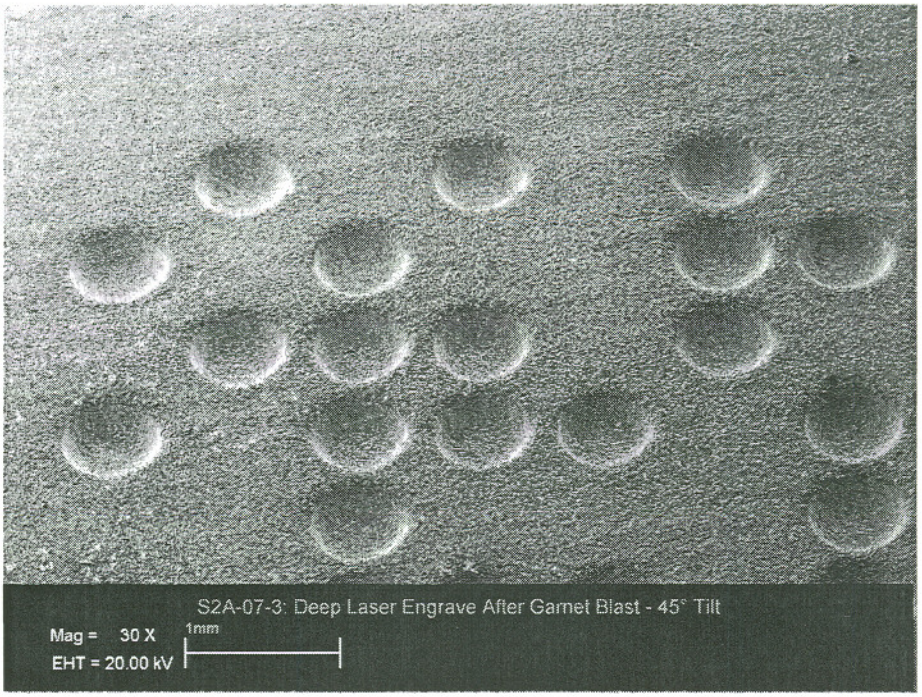


Figure S2A.3.1: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Garnet Blast - 45° Tilt (~30X)

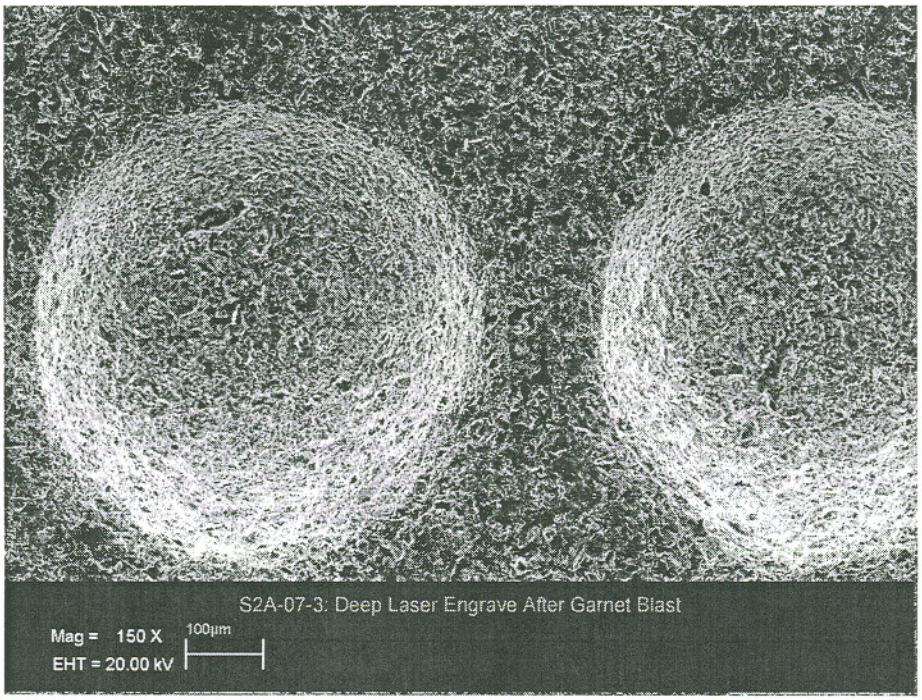


Figure S2A.3.2: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Garnet Blast (~150X)

Figure S2A.3.3: SEM Surface Image of Deep Laser Engrave Cell Bottom
Deep Laser Engrave Mark After Garnet Blast (~1000X)

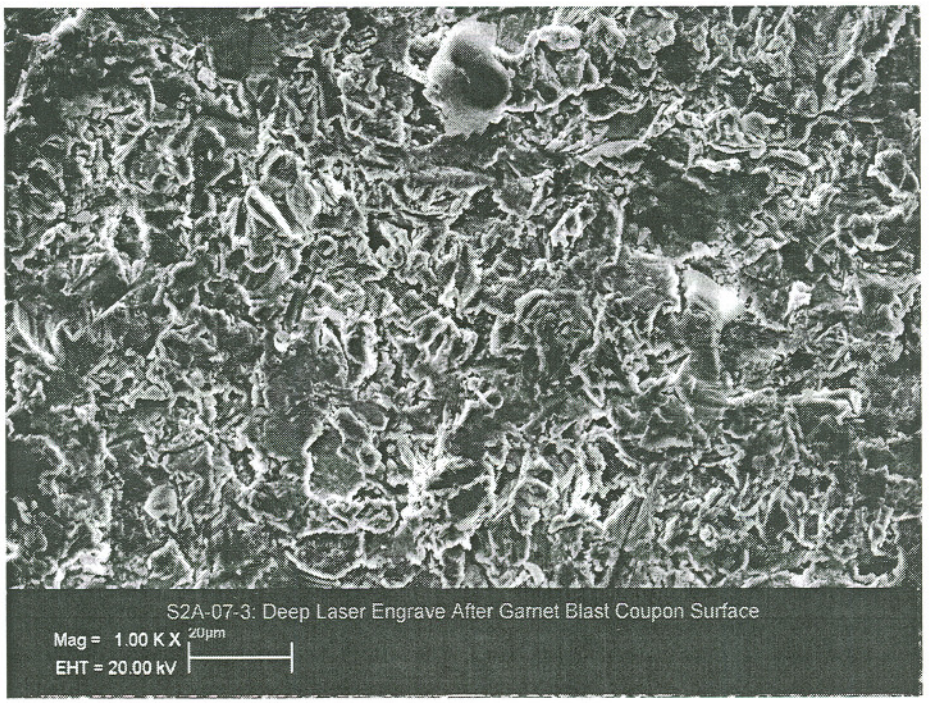


Figure S2A.3.4: SEM Surface Image of Coupon Surface
Deep Laser Engrave Mark After Garnet Blast (~1000X)

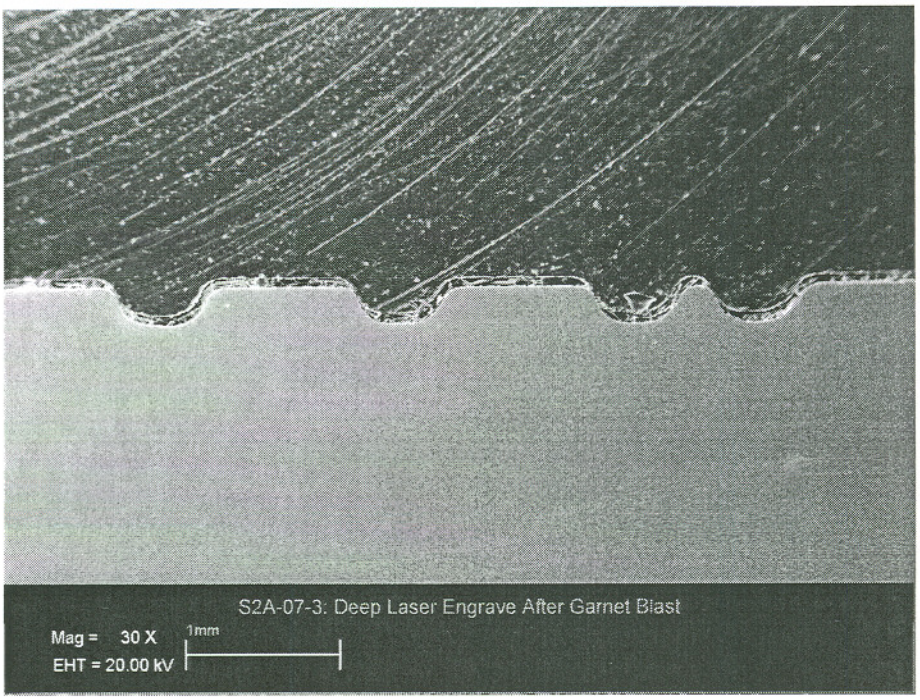


Figure S2A.3.5: SEM Cross Section Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Garnet Blast (~30X)

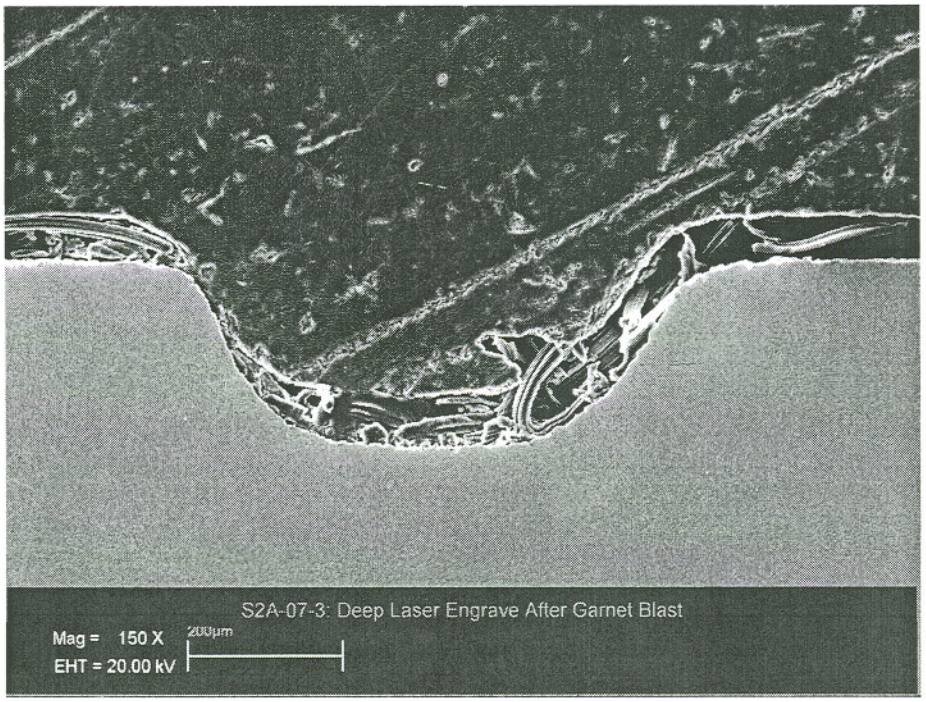


Figure S2A.3.6: SEM Cross Section Image of Deep Laser Engrave Cell
Deep Laser Engrave Mark After Garnet Blast (~150X)

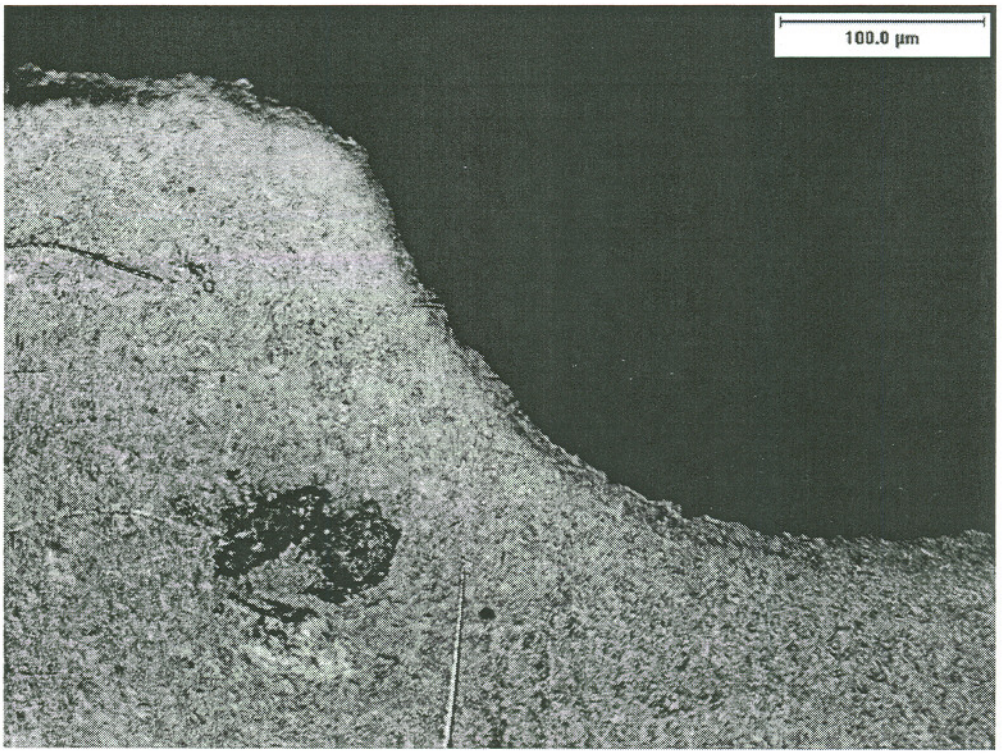


Figure S2A.3.7: Optical Cross Section Image of Etched Deep Laser Engrave Cell
Deep Laser Engrave Mark After Garnet Blast

COUPON A2A

Deep Laser Engrave Mark

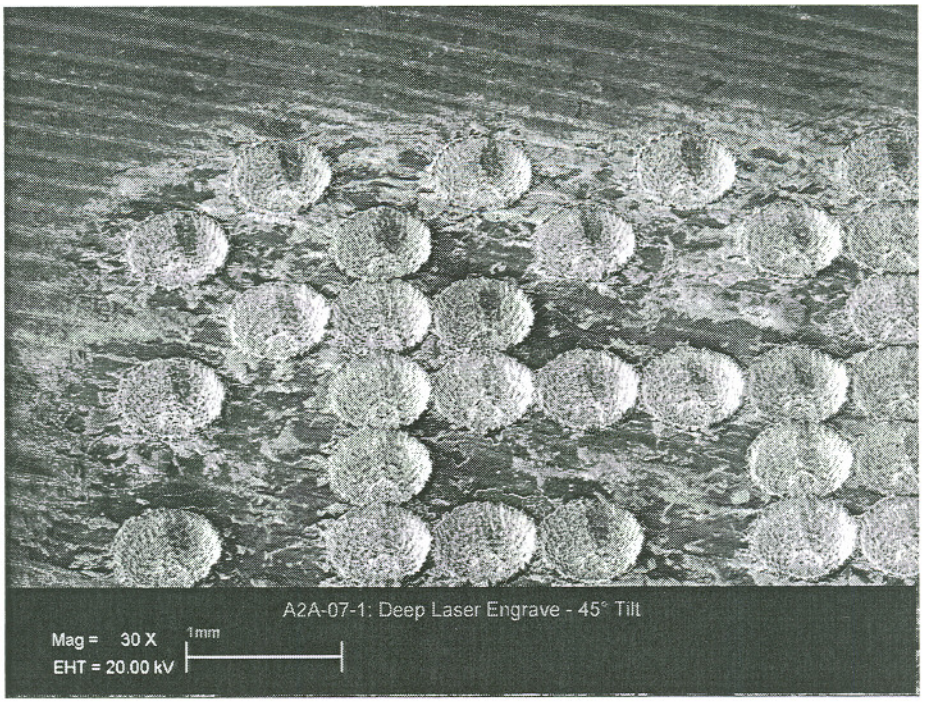


Figure A2A.1.1: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark - 45° Tilt (~30X)

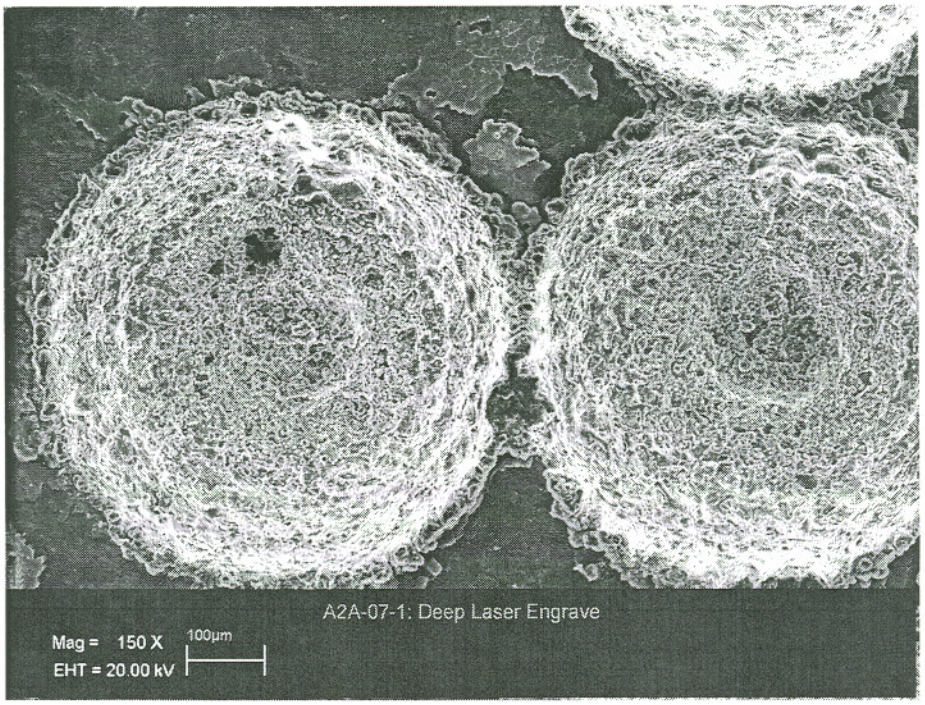


Figure A2A.1.2: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark (~150X)

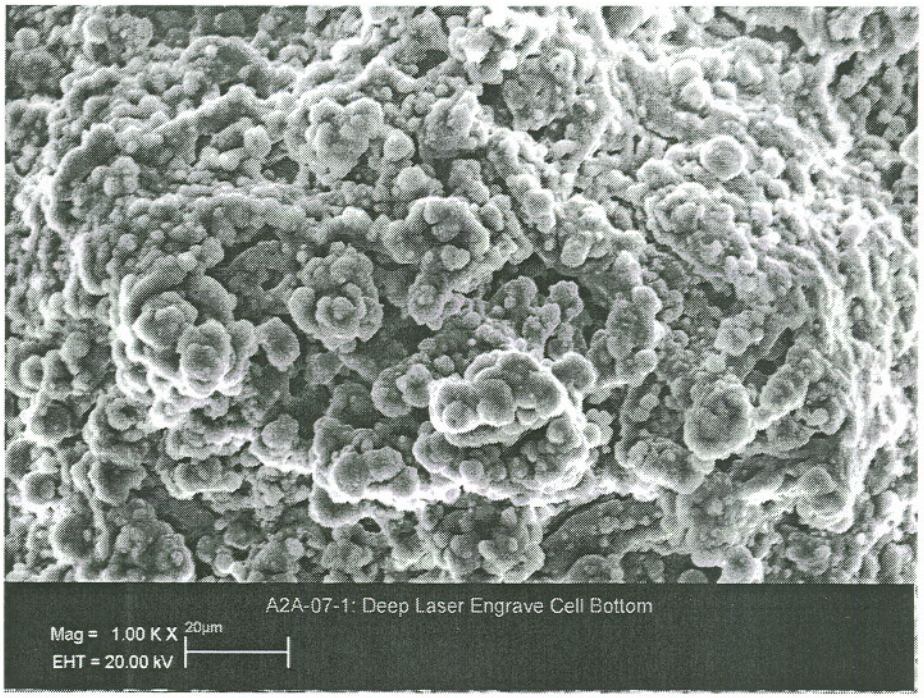


Figure A2A.1.3: SEM Surface Image of Deep Laser Engrave Cell Bottom
Deep Laser Engrave Mark (~1000X)

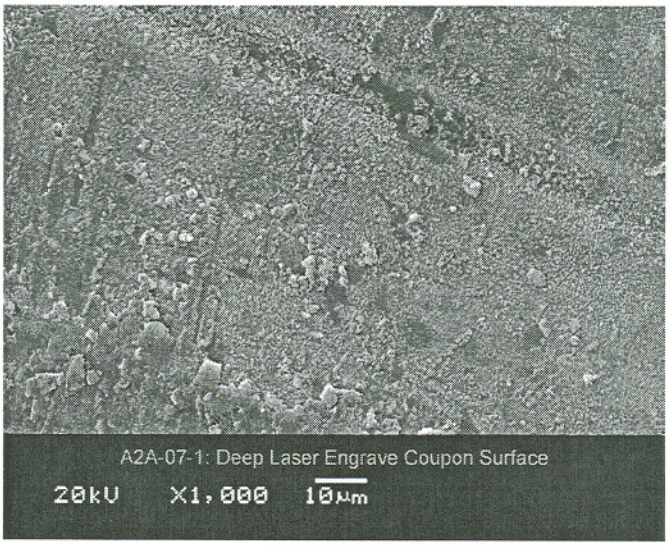


Figure A2A.1.4: SEM Surface Image of Coupon Surface
Deep Laser Engrave Mark (~1000X)

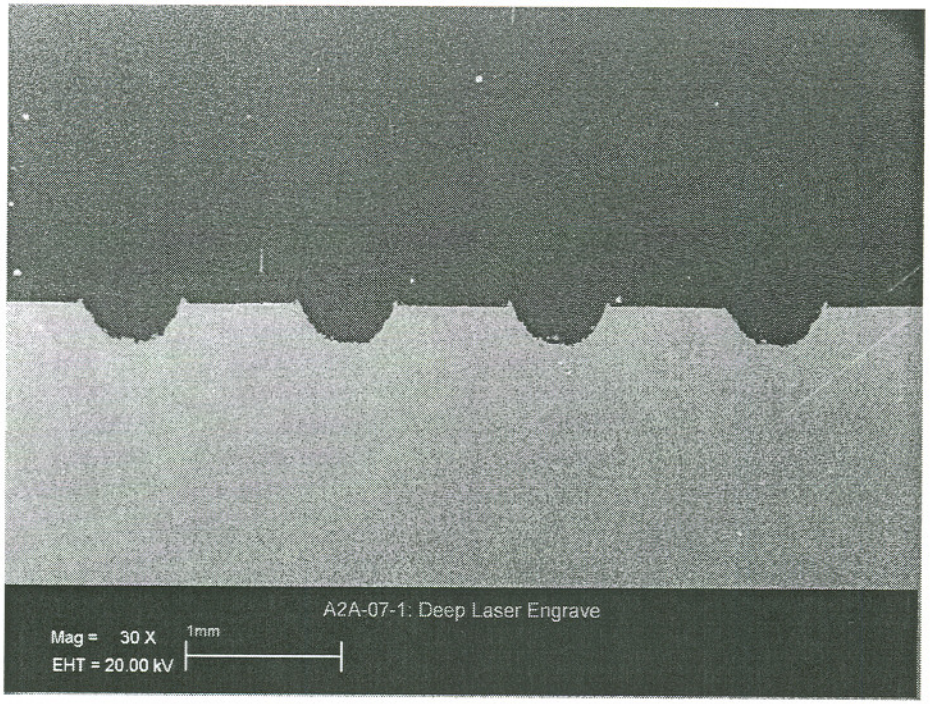


Figure A2A.1.5: SEM Cross Section Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark (~30X)

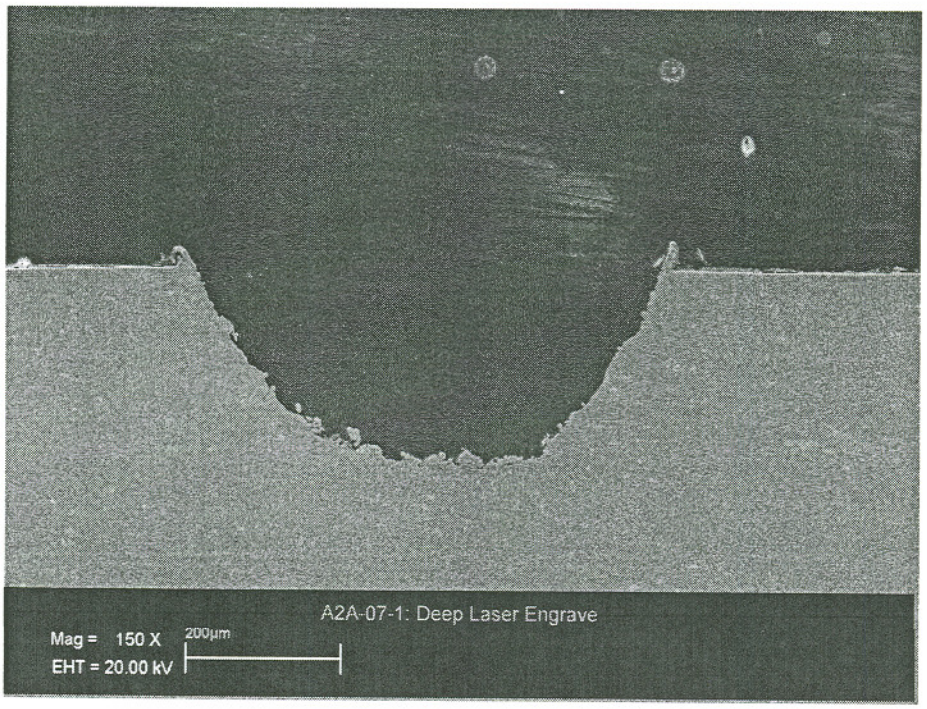


Figure A2A.1.6: SEM Cross Section Image of Deep Laser Engrave Cell
Deep Laser Engrave Mark (~150X)

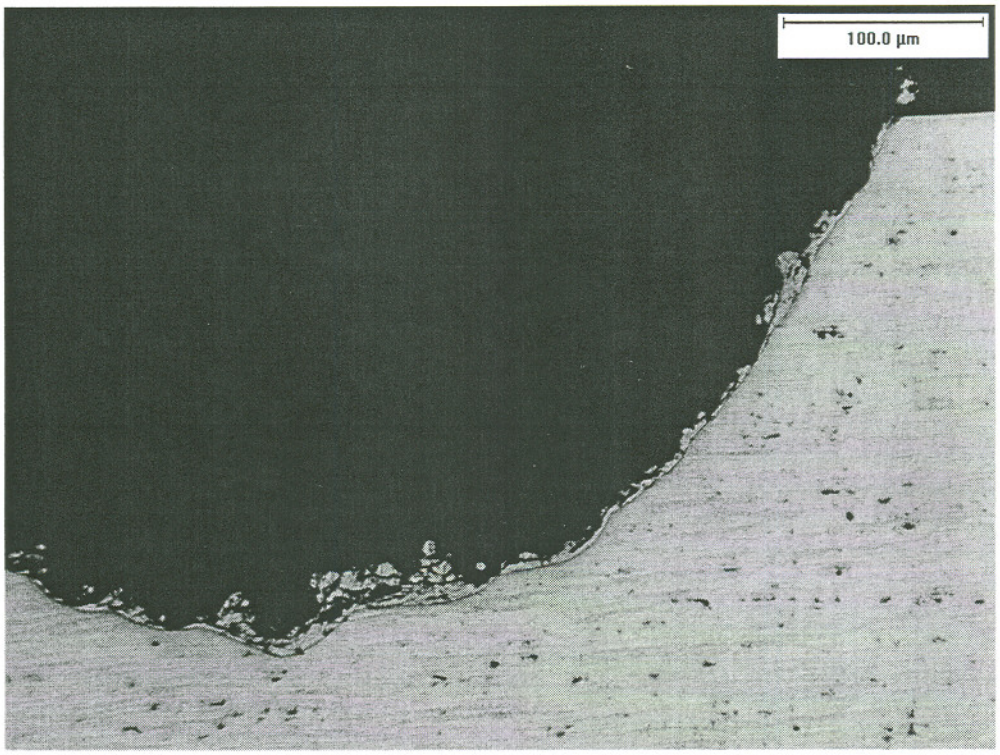


Figure A2A.1.7: Optical Cross Section Image of Etched Deep Laser Engrave Cell
Deep Laser Engrave Mark

Deep Laser Engrave Mark After Glass Blast

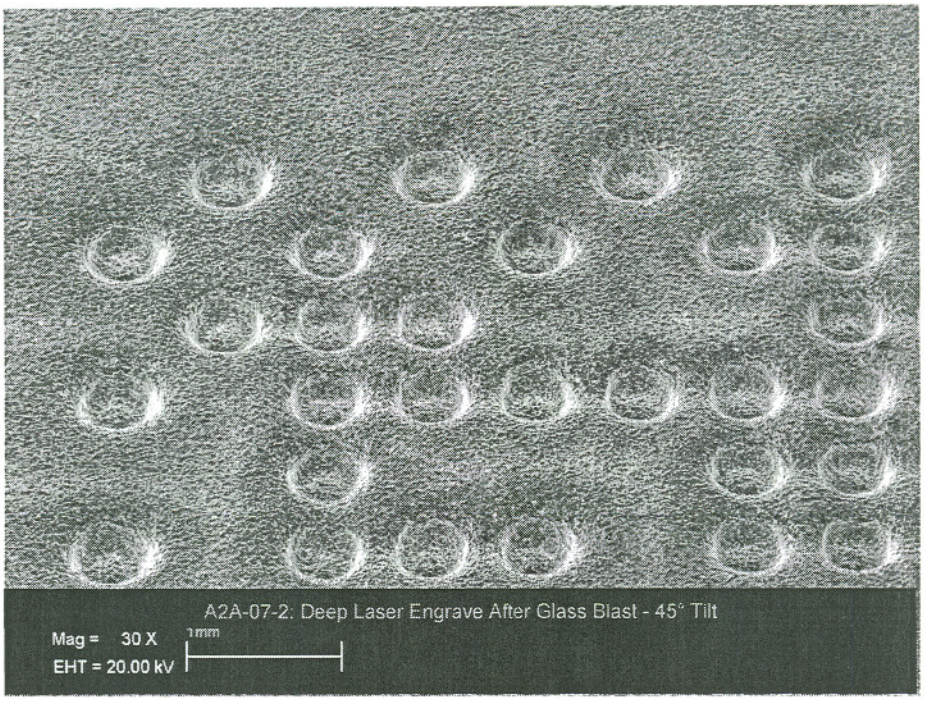


Figure A2A.2.1: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Glass Blast - 45° Tilt (~30X)

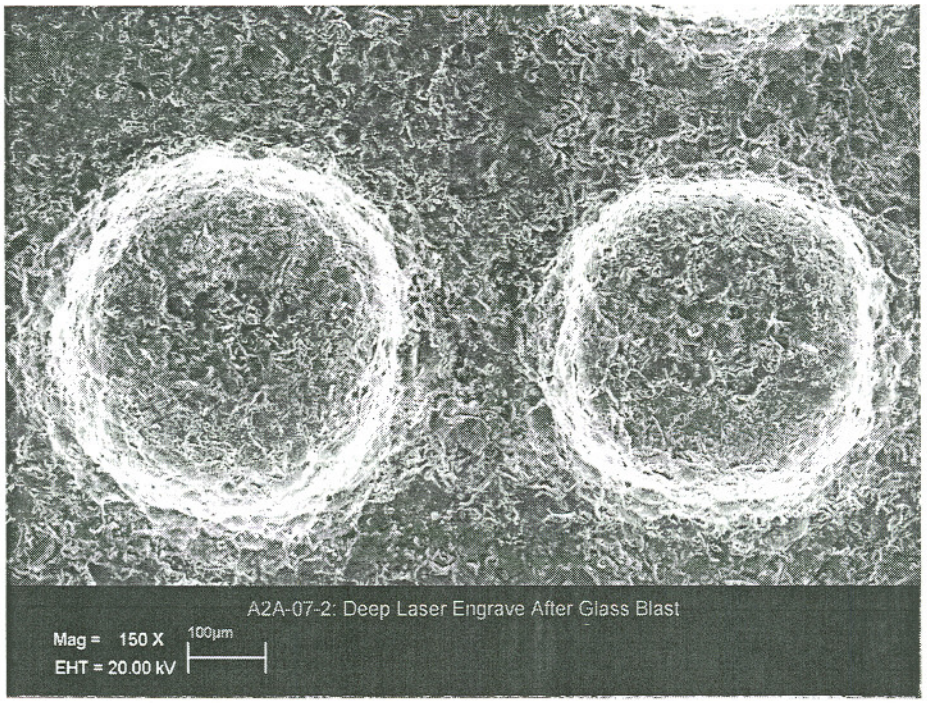


Figure A2A.2.2: SEM Surface Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Glass Blast (~150X)

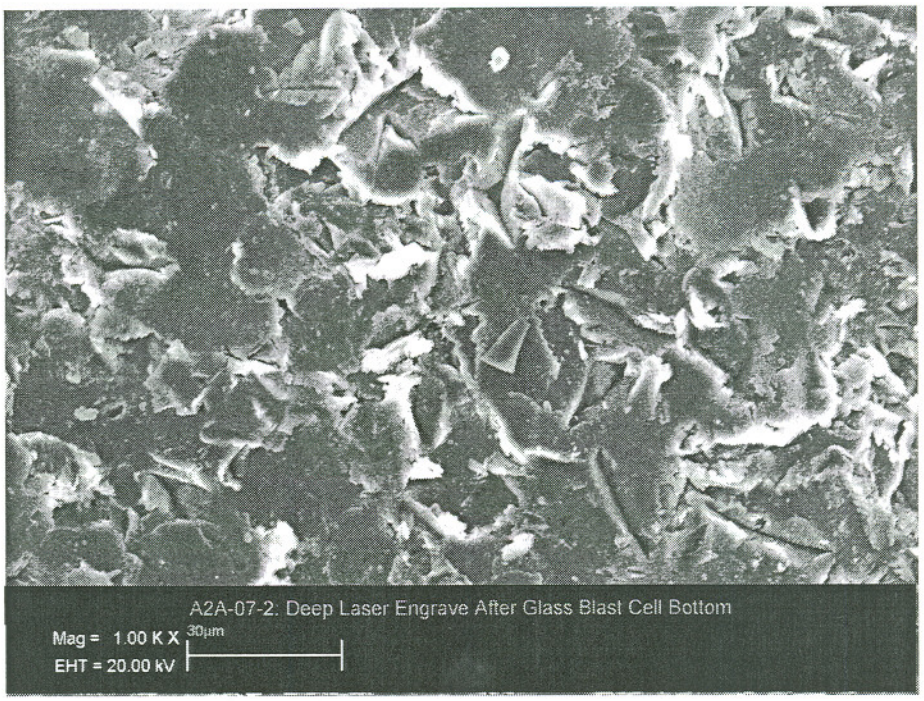


Figure A2A.2.3: SEM Surface Image of Deep Laser Engrave Cell Bottom
Deep Laser Engrave Mark After Glass Blast (~1000X)

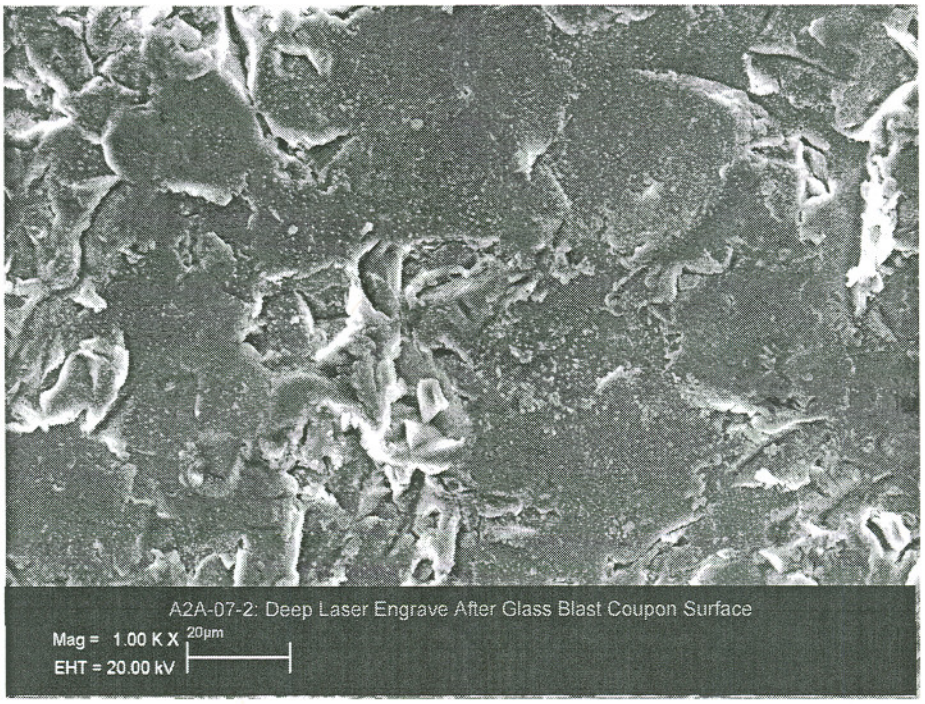


Figure A2A.2.4: SEM Surface Image of Coupon Surface
Deep Laser Engrave Mark After Glass Blast (~1000X)

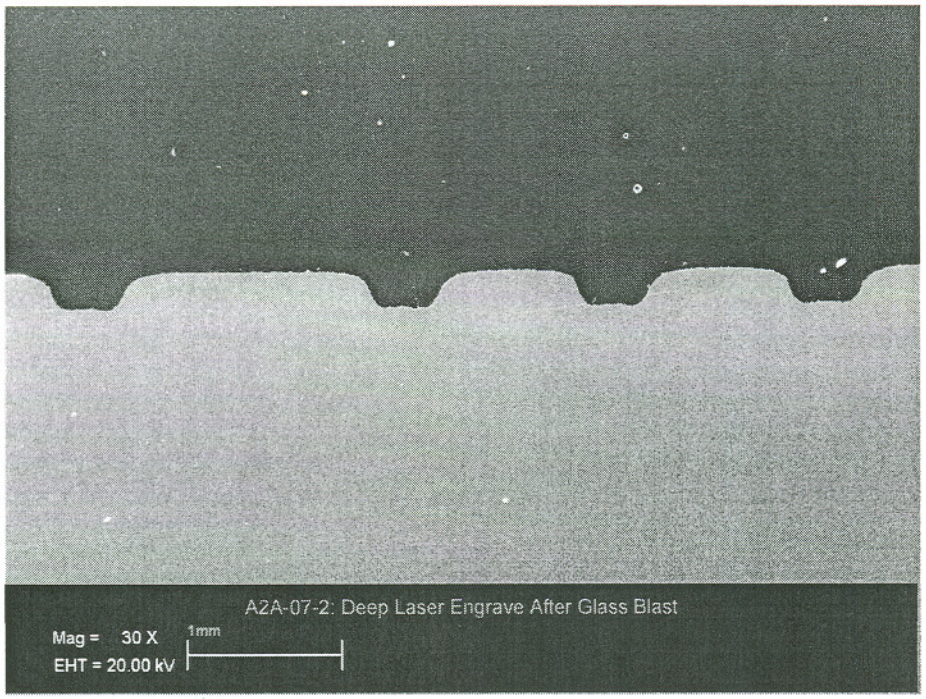


Figure A2A.2.5: SEM Cross Section Image of Deep Laser Engrave Cells
Deep Laser Engrave Mark After Glass Blast (~30X)

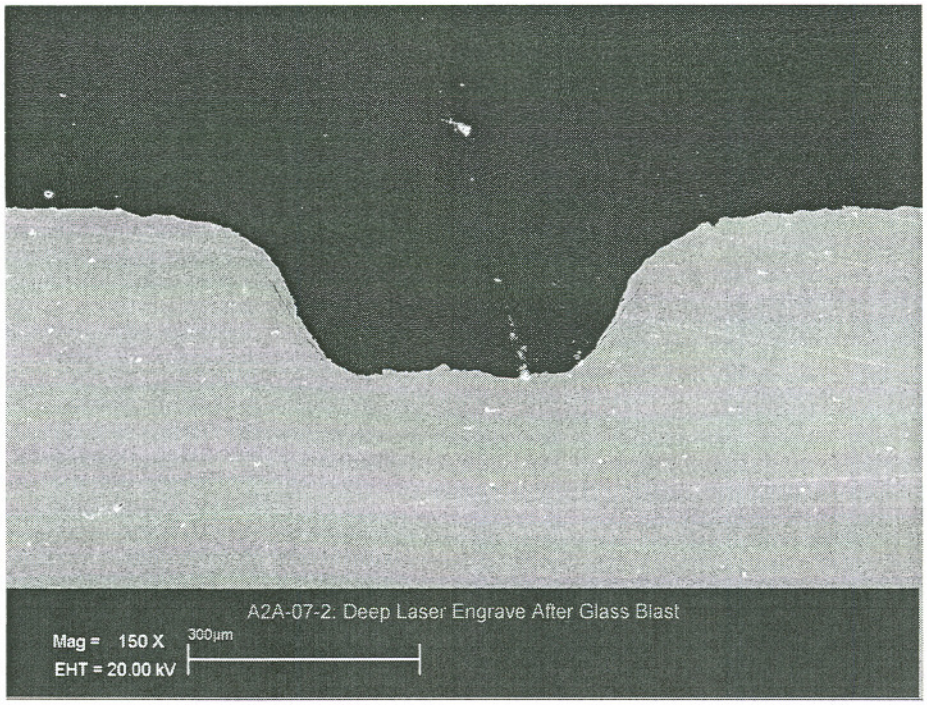


Figure A2A.2.6: SEM Cross Section Image of Deep Laser Engrave Cell
Deep Laser Engrave Mark After Glass Blast (~150X)

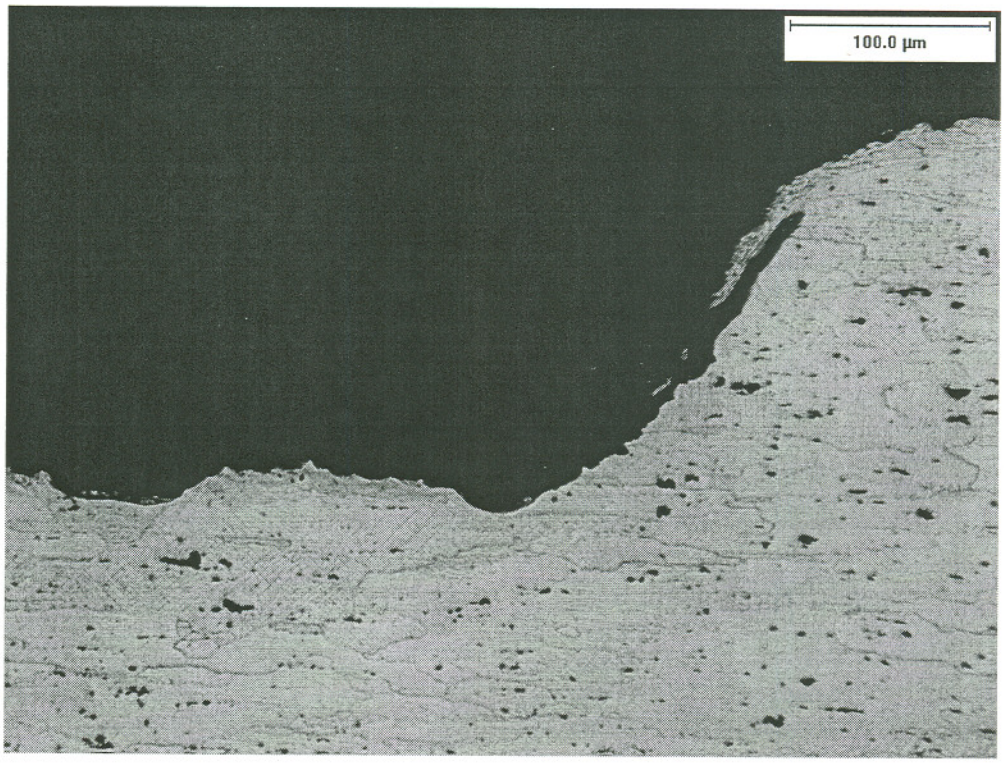


Figure A2A.2.7: Optical Cross Section Image of Etched Deep Laser Engrave Cell
Deep Laser Engrave Mark After Glass Blast

APPENDIX F
COUPON MARK MICROSCOPY DOCUMENTATION
MICROHARDNESS DATA

COUPON S2A

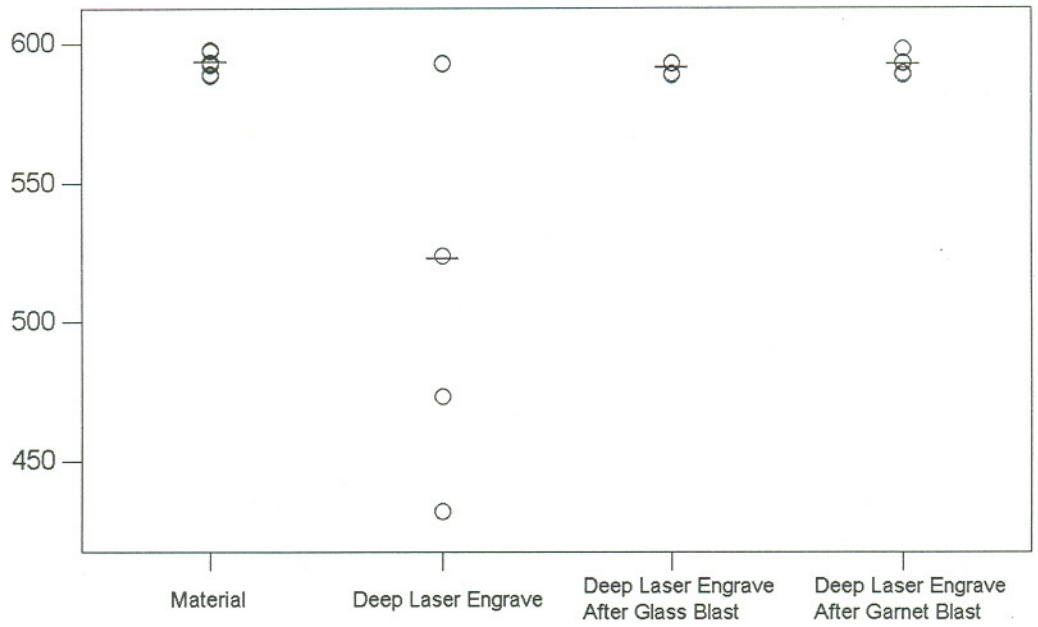
Coupon S2A-07: Microhardness Data for 200g Load with a 30s Dwell Time

Mark	Depth Below Cell Bottom (in)	Indent Diagonal (μm)	Diamond Pyramid Hardness DPH (kg/mm^2)
-1 Deep Laser Engrave	0.001	30.3	432
	0.002	28.2	473
	0.003	26.6	524
	0.004	25.0	593
	0.005	25.0	593
	0.006	24.9	598
	Core	25.1	589
	Core	24.9	598
	Core	25.0	593
	Core	25.0	593
-2 Deep Laser Engrave After Glass Blast	0.001	25.0	593
	0.002	25.1	589
	0.003	25.0	593
	0.004	25.1	589
	0.005	25.0	593
	0.006	25.1	589
	Core	24.9	598
	Core	25.0	593
	Core	25.1	589
	Core	25.0	593
-3 Deep Laser Engrave After Garnet Blast	0.001	25.1	589
	0.002	25.0	593
	0.003	25.0	593
	0.004	24.9	598
	0.005	25.1	589
	0.006	25.0	593
	Core	24.9	598
	Core	25.0	593
	Core	24.9	598
	Core	25.1	589

Coupon S2A-07: Microhardness Data for 200g Load with a 30s Dwell Time

Mark	Depth From Cell Side (in)	Indent Diagonal (μm)	Diamond Pyramid Hardness DPH (kg/mm^2)
-2 Deep Laser Engrave After Glass Blast	0.001	25.0	593
	0.002	25.0	593
	0.003	25.1	589
-3 Deep Laser Engrave After Garnet Blast	0.001	25.1	589
	0.002	25.0	593
	0.003	25.1	589

Coupon S2A: Dot Plot of Microhardness Data at Depths Less Than 0.005in from the Cell Bottom 200g Load with a 30s Dwell Time



Coupon S2A: ANOVA of Microhardness Data at Depths Less Than 0.005in from the Cell Bottom 200g Load with a 30s Dwell Time

```
Analysis of Variance
Source      DF        SS        MS        F        P
Factor       3     19905      6635     7.34    0.001
Error       23     20799       904
Total       26     40704
                                     Individual 95% CIs For Mean
                                     Based on Pooled StDev
Level        N      Mean     StDev   ---------+---------+---------+-------
Material    12    593.67      3.60                        (-----*----)
DLE          5    523.00     71.73   (-------*-------)
DLE+Glass    5    591.40      2.19                     (-------*-------)
DLE+Garnet   5    592.40      3.71                     (-------*-------)
                                     ---------+---------+---------+-------
Pooled StDev =    30.07                     525       560       595
```

COUPON A2A

Coupon A2A-07: Microhardness Data for 100g Load with a 30s Dwell Time

Mark	Depth Below Cell Bottom (in)	Indent Diagonal (μm)	Diamond Pyramid Hardness DPH (kg/mm^2)
-1 Deep Laser Engrave	0.001	34.4	157
	0.002	34.8	153
	0.003	34.9	152
	0.004	34.5	156
	0.005	34.4	157
	0.006	34.4	157
	Core	34.4	157
	Core	34.5	156
	Core	34.4	157
	Core	34.6	155
-2 Deep Laser Engrave	0.001	37.4	133
After Glass Blast	0.002	36.4	140
Cell A	0.002	36.0	143
	0.004	35.0	151
	0.005	35.1	151
	0.006	34.6	155
	Core	34.9	152
	Core	35.1	151
	Core	34.9	152
	Core	35.0	151
-2 Deep Laser Engrave	0.001	40.8	111
After Glass Blast	0.002	33.6	164
Cell B	0.003	33.7	163
	0.004	33.7	163
	0.005	33.6	164
	0.006	33.7	163
	Core	33.8	162
	Core	33.7	163
	Core	33.7	163
	Core	33.6	164

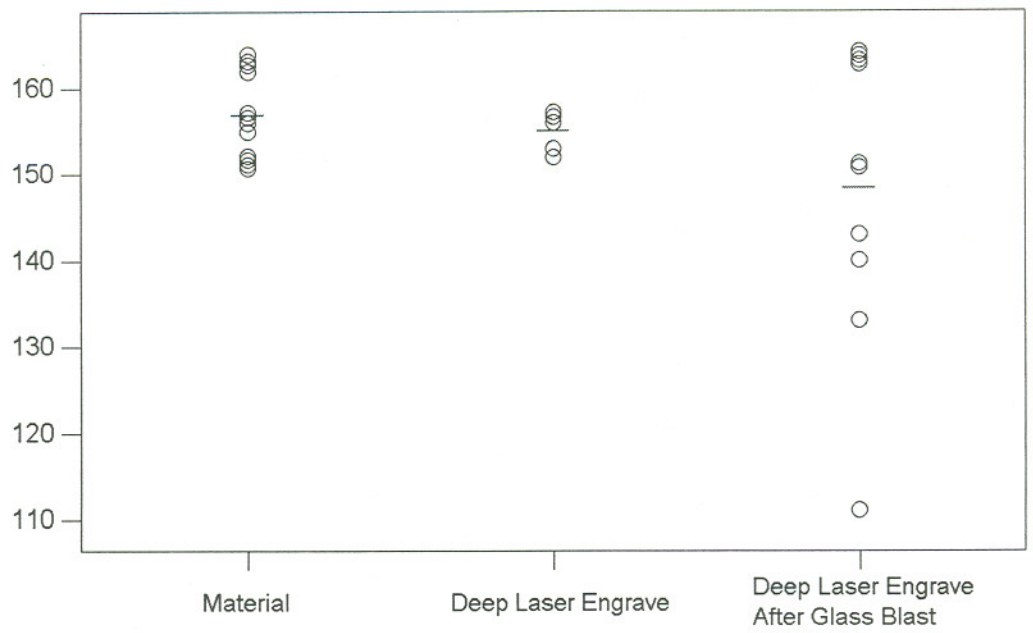
Coupon A2A-07: Microhardness Data for 50g Load with a 30s Dwell Time

Mark	Depth Below Cell Bottom (in)	Indent Diagonal (μm)	Diamond Pyramid Hardness DPH (kg/mm^2)
-1 Deep Laser Engrave	0.001	25.1	147
	0.002	25.0	149
	0.003	25.0	149
	0.005	25.1	147
-2 Deep Laser Engrave	0.001	23.1	174
After Glass Blast	0.002	24.9	150
	0.003	25.0	149
	0.005	24.8	151

Coupon A2A-07: Microhardness Data for 50g Load with a 30s Dwell Time

Mark	Depth From Cell Side (in)	Indent Diagonal (μm)	Diamond Pyramid Hardness DPH (kg/mm^2)
-1 Deep Laser Engrave	0.001	24.8	151
	0.002	24.9	150
	0.003	24.8	151
-2 Deep Laser Engrave	0.001	25.0	148
After Glass Blast	0.002	24.9	150
	0.003	24.8	151

Coupon A2A: Dot Plot of Microhardness Data at Depths Less Than 0.005in from the Cell Bottom 100g Load with a 30s Dwell Time



Coupon A2A: ANOVA of Microhardness Data at Depths Less Than 0.005in from the Cell Bottom 100g Load with a 30s Dwell Time

```
Analysis of Variance: Cell A and Cell B Combined
Source      DF        SS        MS        F        P
Factor       2       421       211     1.71    0.202
Error       24      2957       123
Total       26      3378
                                     Individual 95% CIs For Mean
                                     Based on Pooled StDev
Level        N      Mean     StDev   ---------+---------+---------+-------
Material    12    156.92      4.98                 (--------*---------)
DLE          5    155.00      2.35         (-------------*-------------)
DLE+Glass   10    148.30     17.20    (---------*---------)
                                     ---------+---------+---------+-------
Pooled StDev =    11.10                  147.0     154.0     161.0
```

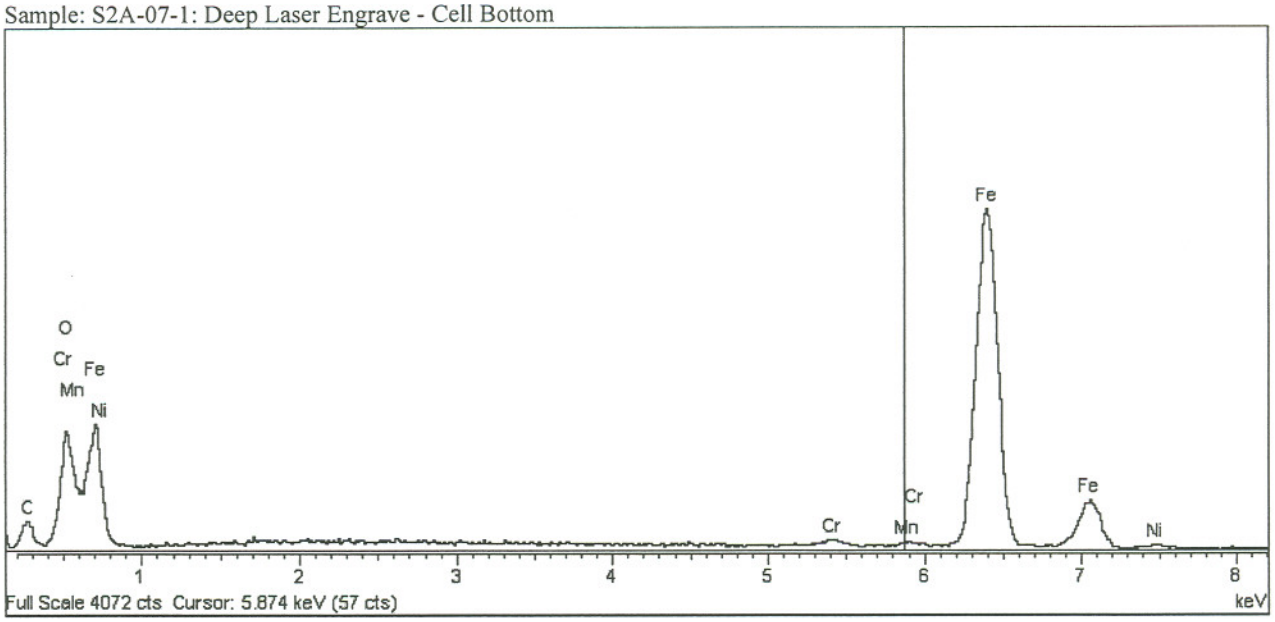
```
Analysis of Variance: Cell A and Cell B Considered Separately
Source      DF        SS        MS        F        P
Factor       3       642       214     1.80    0.175
Error       23      2736       119
Total       26      3378
                                     Individual 95% CIs For Mean
                                     Based on Pooled StDev
Level        N      Mean     StDev   -------+---------+---------+---------
Material    12    156.92      4.98                   (------*-----)
DLE          5    155.00      2.35               (---------*---------)
DLE+Glass A 5     143.60      7.67    (---------*---------)
DLE+Glass B 5     153.00     23.48            (---------*---------)
                                     -------+---------+---------+---------
Pooled StDev =    10.91                  140       150       160
```

APPENDIX G
COUPON MARK MICROSCOPY DOCUMENTATION
SEM-EDX COMPOSITION DATA

COUPON S2A

Material Analysis

Sample: S2A-07-1: Deep Laser Engrave - Cell Bottom



Spectrum processing:
No peaks omitted

Processing option: All elements analyzed (Normalised)
Number of iterations = 3

Standard:
C CaCO3 1-Jun-1999 12:00 AM
O SiO2 1-Jun-1999 12:00 AM
Cr Cr 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Ni Ni 1-Jun-1999 12:00 AM

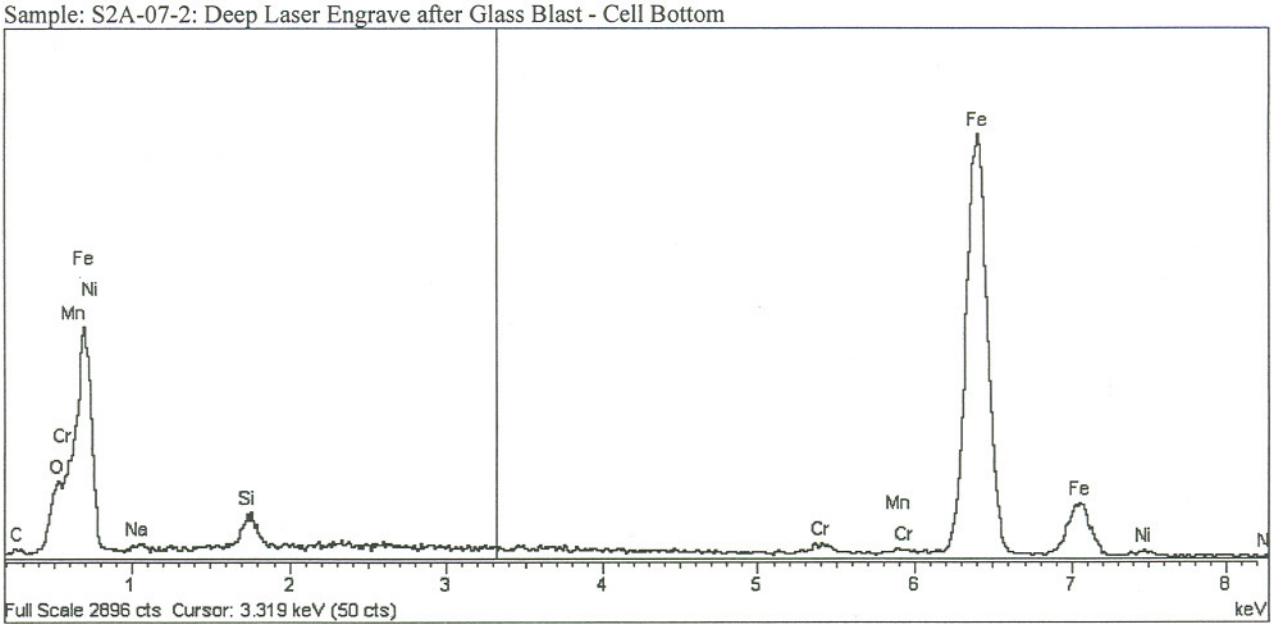
Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
C K	4.74	0.5001	11.71	0.63	30.53
O K	14.36	1.2395	14.29	0.70	27.98
Cr K	0.67	1.1792	0.70	0.09	0.42
Mn K	0.35	0.9183	0.47	0.13	0.27
Fe K	54.39	0.9362	71.66	0.80	40.18
Ni K	0.82	0.8596	1.18	0.17	0.63
Totals			100.00		

Sample Notes: 8/22/2003
S2A-07-1: Deep Laser Engrave - Cell Bottom
600X Area

GENERAL ATOMICS
Electron Analysis Lab

Material Analysis

Sample: S2A-07-2: Deep Laser Engrave after Glass Blast - Cell Bottom



Spectrum processing:
No peaks omitted

Processing option: All elements analyzed (Normalised)
Number of iterations = 3

Standard:
C CaCO3 1-Jun-1999 12:00 AM
O SiO2 1-Jun-1999 12:00 AM
Na Albite 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
Cr Cr 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Ni Ni 1-Jun-1999 12:00 AM

Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
C K	1.74	0.4273	3.37	0.67	11.76
O K	11.48	1.3893	6.84	0.83	17.92
Na K	0.56	0.4036	1.14	0.26	2.08
Si K	1.89	0.6702	2.34	0.14	3.49
Cr K	1.34	1.2178	0.91	0.12	0.74
Mn K	0.62	0.9491	0.54	0.16	0.41
Fe K	97.70	0.9689	83.50	1.02	62.64
Ni K	1.44	0.8771	1.36	0.24	0.97
Totals			100.00		

Sample Notes: 8/22/2003
S2A-07-2: Deep Laser Engrave after Glass Blast - Cell Bottom
600X Area

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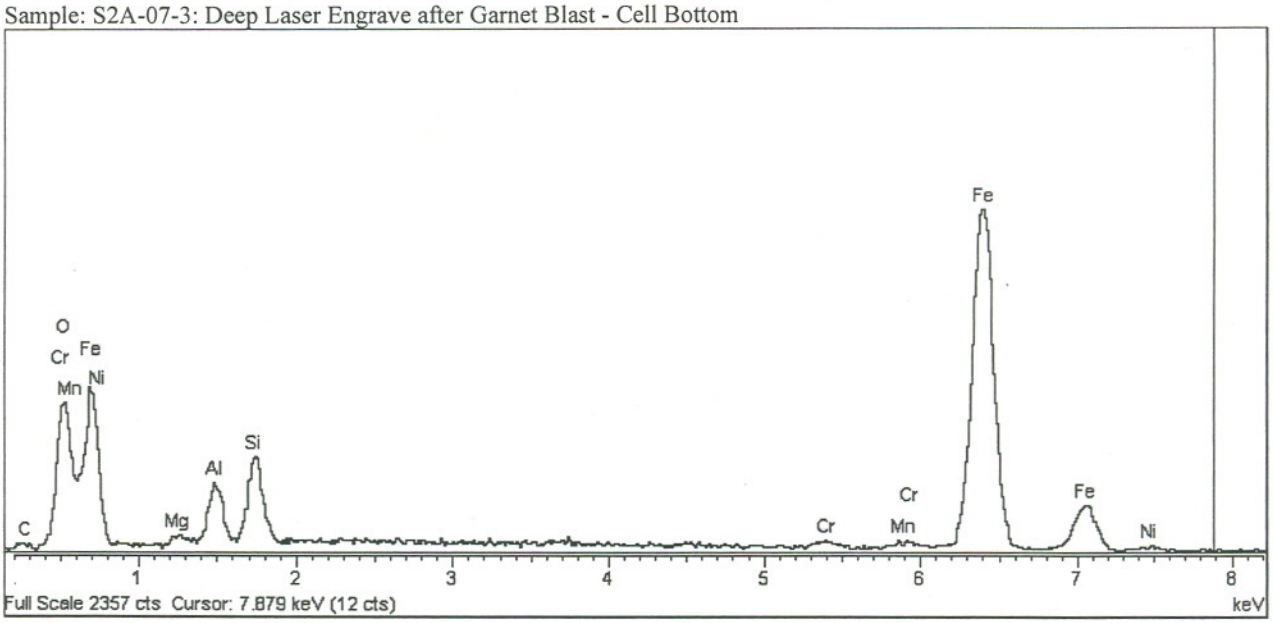
Material Analysis

Sample: S2A-07-3: Deep Laser Engrave after Garnet Blast - Cell Bottom



Spectrum processing:
Peak possibly omitted: 4.495 keV

Processing option: All elements analyzed (Normalised)
Number of iterations = 3

Standard:
C CaCO3 1-Jun-1999 12:00 AM
O SiO2 1-Jun-1999 12:00 AM
Mg MgO 1-Jun-1999 12:00 AM
Al Al2O3 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
Cr Cr 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Ni Ni 1-Jun-1999 12:00 AM

Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
C K	1.27	0.3883	3.58	0.73	10.04
O K	19.92	1.3224	16.49	0.89	34.74
Mg K	0.37	0.4651	0.87	0.16	1.21
Al K	2.27	0.5861	4.25	0.19	5.31
Si K	3.70	0.6852	5.91	0.20	7.10
Cr K	0.68	1.1325	0.66	0.12	0.43
Mn K	0.63	0.9170	0.75	0.17	0.46
Fe K	56.82	0.9360	66.42	0.93	40.10
Ni K	0.85	0.8664	1.07	0.20	0.61
Totals			100.00		

Sample Notes: 8/22/2003
S2A-07-3: Deep Laser Engrave after Garnet Blast - Cell Bottom
600X Area

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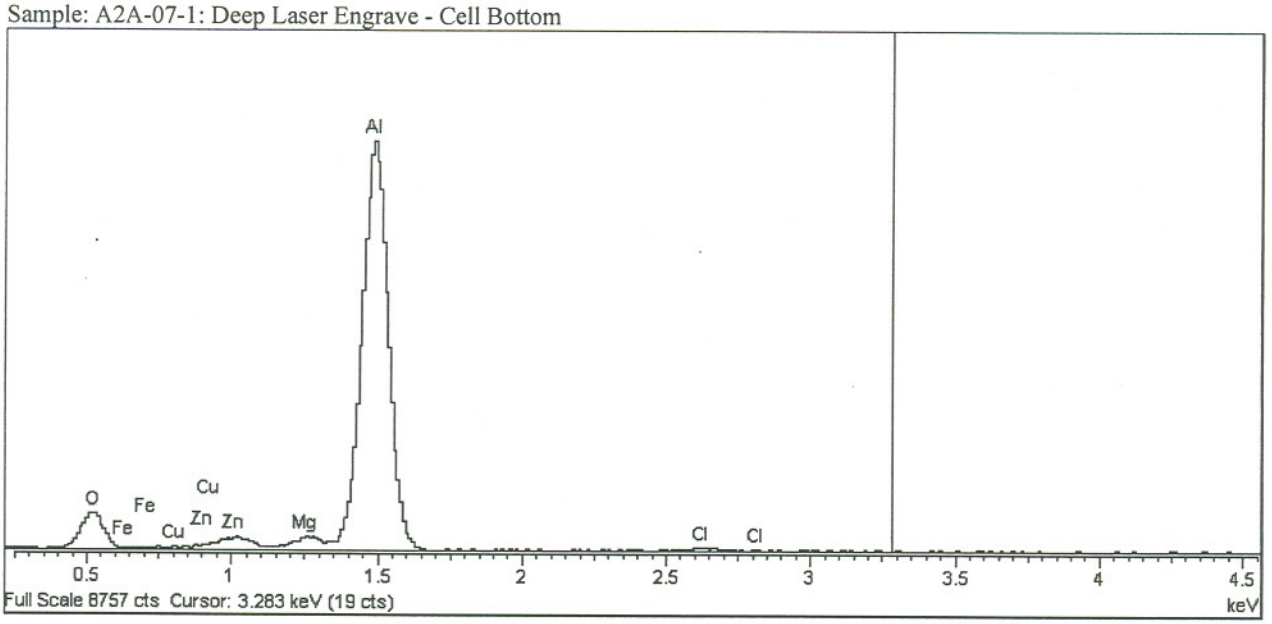
COUPON A2A

Material Analysis

Sample: A2A-07-1: Deep Laser Engrave - Cell Bottom



Spectrum processing:
No peaks omitted

Processing option: All elements analyzed (Normalised)
Number of iterations = 4

Standard:
O SiO2 1-Jun-1999 12:00 AM
Mg MgO 1-Jun-1999 12:00 AM
Al Al2O3 1-Jun-1999 12:00 AM
Cl KCl 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Cu Cu 1-Jun-1999 12:00 AM
Zn Zn 1-Jun-1999 12:00 AM

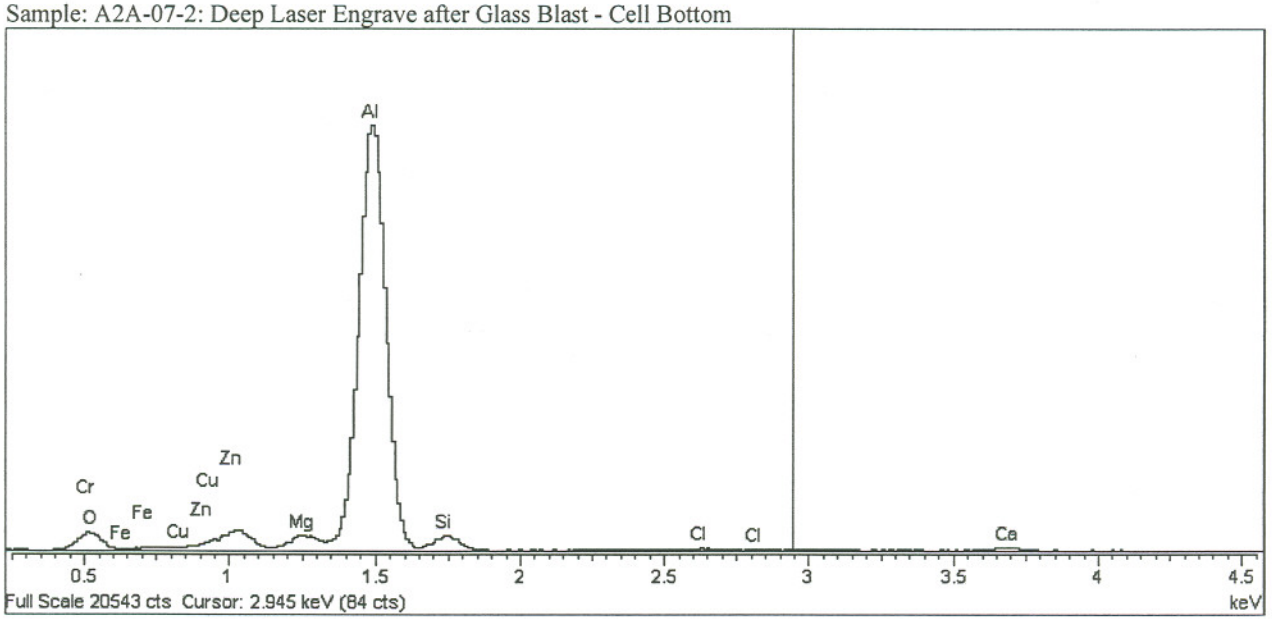
Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
O K	12.26	0.9215	25.67	0.50	38.04
Mg K	0.90	0.9521	1.83	0.14	1.79
Al K	33.13	0.9817	65.14	0.55	57.22
Cl K	0.25	0.6749	0.71	0.10	0.48
Fe K	0.35	0.8625	0.79	0.16	0.33
Cu K	0.75	0.8287	1.74	0.29	0.65
Zn L	1.38	0.6475	4.12	0.33	1.49
Totals			100.00		

Sample Notes: 8/22/2003
A2A-07-1: Deep Laser Engrave - Cell Bottom
600X Area

GENERAL ATOMICS
Electron Analysis Lab

Material Analysis

Sample: A2A-07-2: Deep Laser Engrave after Glass Blast - Cell Bottom



Spectrum processing:
No peaks omitted

Processing option: All elements analyzed (Normalised)
Number of iterations = 4

Standard:
O SiO2 1-Jun-1999 12:00 AM
Mg MgO 1-Jun-1999 12:00 AM
Al Al2O3 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
Cl KCl 1-Jun-1999 12:00 AM
Ca Wollastonite 1-Jun-1999 12:00 AM
Cr Cr 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Cu Cu 1-Jun-1999 12:00 AM
Zn Zn 1-Jun-1999 12:00 AM

Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
O K	9.76	0.7991	14.00	0.51	22.63
Mg K	1.96	0.9923	2.27	0.10	2.41
Al K	60.48	1.0054	68.94	0.49	66.08
Si K	2.16	0.5020	4.94	0.15	4.55
Cl K	0.24	0.6567	0.42	0.07	0.30
Ca K	0.65	0.9533	0.78	0.06	0.51
Cr K	0.26	0.8583	0.34	0.08	0.17
Fe K	0.58	0.8698	0.76	0.10	0.35
Cu K	1.01	0.8401	1.38	0.16	0.56
Zn L	4.00	0.7421	6.17	0.24	2.44
Totals			100.00		

Sample Notes: 8/22/2003
A2A-07-2: Deep Laser Engrave after Glass Blast - Cell Bottom
600X Area

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