



Test Report

Form #: T2.2 - Initial Release: 03/09/2019

April 14th, 2020

Project 20040901

PO#: XXXXXXXXXX

CUSTOMER NAME

ADDRESS 1

ADDRESS 2

Attn: CLIENT NAME

CLIENT EMAIL

CLIENT PHONE

Tissue Dissector Material Identification

LigaSure Exact materials received April 14th, 2020 were analyzed by X-Ray and IR spectroscopy. A results summary is included below. Detailed results and sample photographs can be found in the attached appendices.

Table 1: Material IDs.

MAP Sample ID	Client Sample ID/Description	Results
19121102-01	End Effector Insulation	NYLON 6/T (Polyhexamethylene Terephthalamide) - Glass Filled, TiO ₂ Pigment
19121102-02	Finger loop Plastic	Polycarbonate - Glass Filled, TiO ₂ Pigment
19121102-03	Finger loop Rubber	Polyetherurethane Styrene-Ethylene-Butylene-Styrene Copolymer (PU-SEBS) - TiO ₂ Pigment
19121102-04	Blade Actuation Rod	Polyamide (PA) - Glass Filled
19121102-05	Plug Body (White)	Acrylonitrile Butadiene Styrene (ABS)
19121102-06	Plug Body (Purple)	Acrylonitrile Butadiene Styrene (ABS)
19121102-07	Device Body	Acrylonitrile Butadiene Styrene (ABS)
19121102-08	Blade Actuation Trigger	NYLON 6/T (Polyhexamethylene Terephthalamide) - Glass Filled, TiO ₂ Pigment

Continued on Page 2

Table 1 (Continued)

19121102-09	End Effector Jaw Pin	17-4 PH Stainless Steel
19121102-10	Electrode	316 Stainless Steel
19121102-11	Blade	422 Stainless Steel
19121102-12	End Effector/Handle Metal	301 Stainless Steel
19121102-13	Bottom Jaw Metal	301 Stainless Steel
19121102-14	Bottom Handle Metal	422 Stainless Steel
19.121102-15	Top Handle Left Metal	409 Stainless Steel
19.121102-16	Top Handle Right Metal	409 Stainless Steel

FTIR [ASTM E1252 Qualitative Infrared Spectroscopy]: Thermo Nicolet 380 SN: AGL1003217 with Smart iTR

XRF [ASTM E1621-13 Elemental Analysis by X-Ray Fluorescence]: Amptek X-Ray Spectrometer – SN: X10606

Note: Assigned alloys are the closest/most-common match based on the observed compositions, see the elemental content details in Appendix C for full composition.

Appendix A: Reference Photos

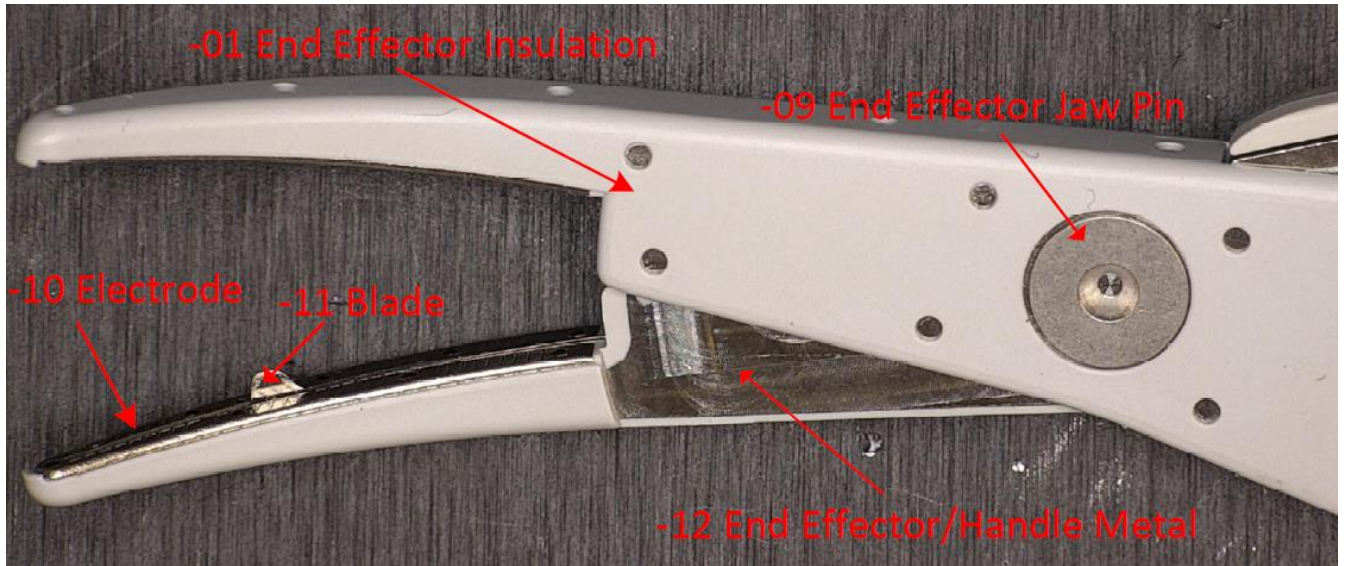


Figure A1: Component Reference Photographs (End Effector).

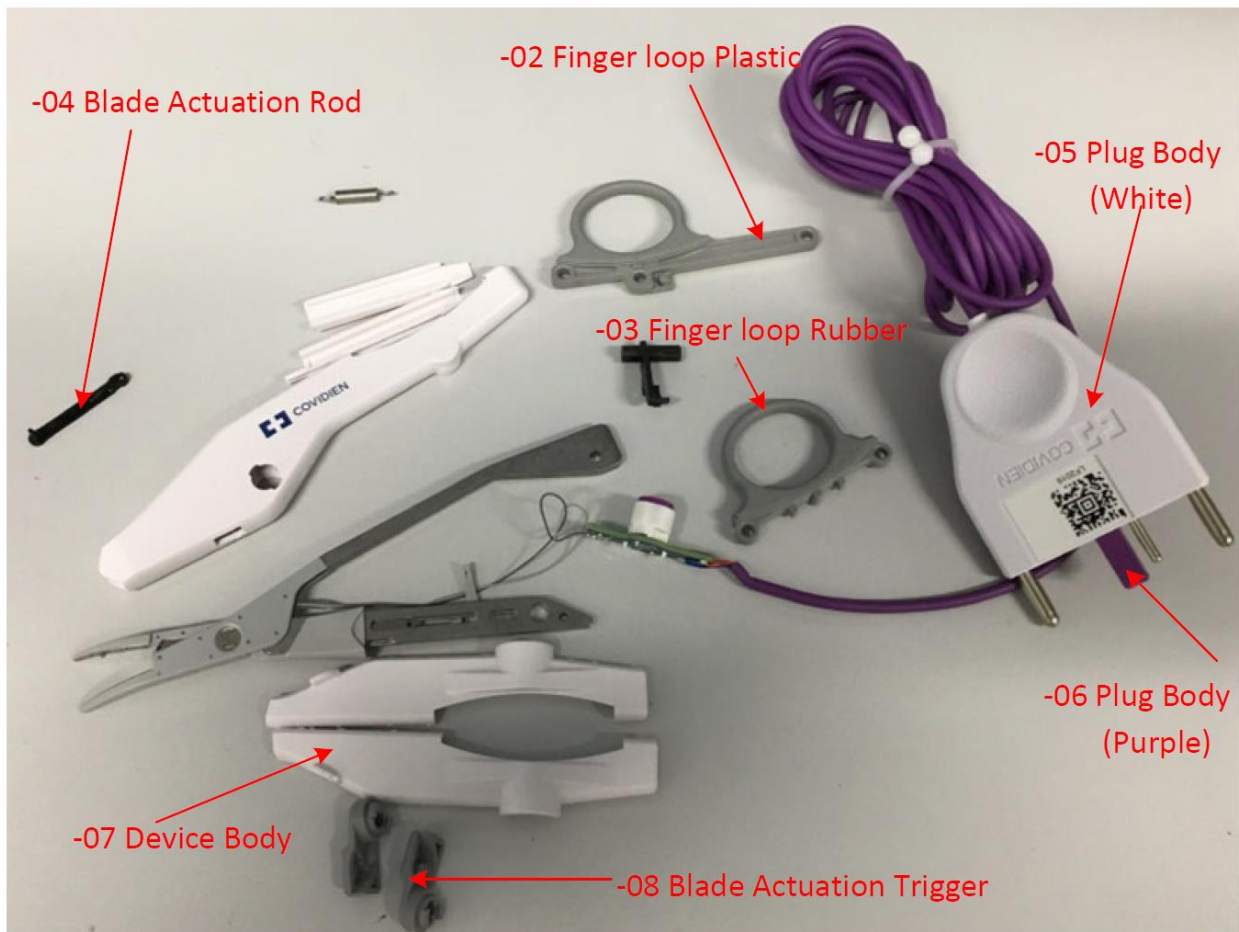


Figure A2: Component Reference Photographs (Body).

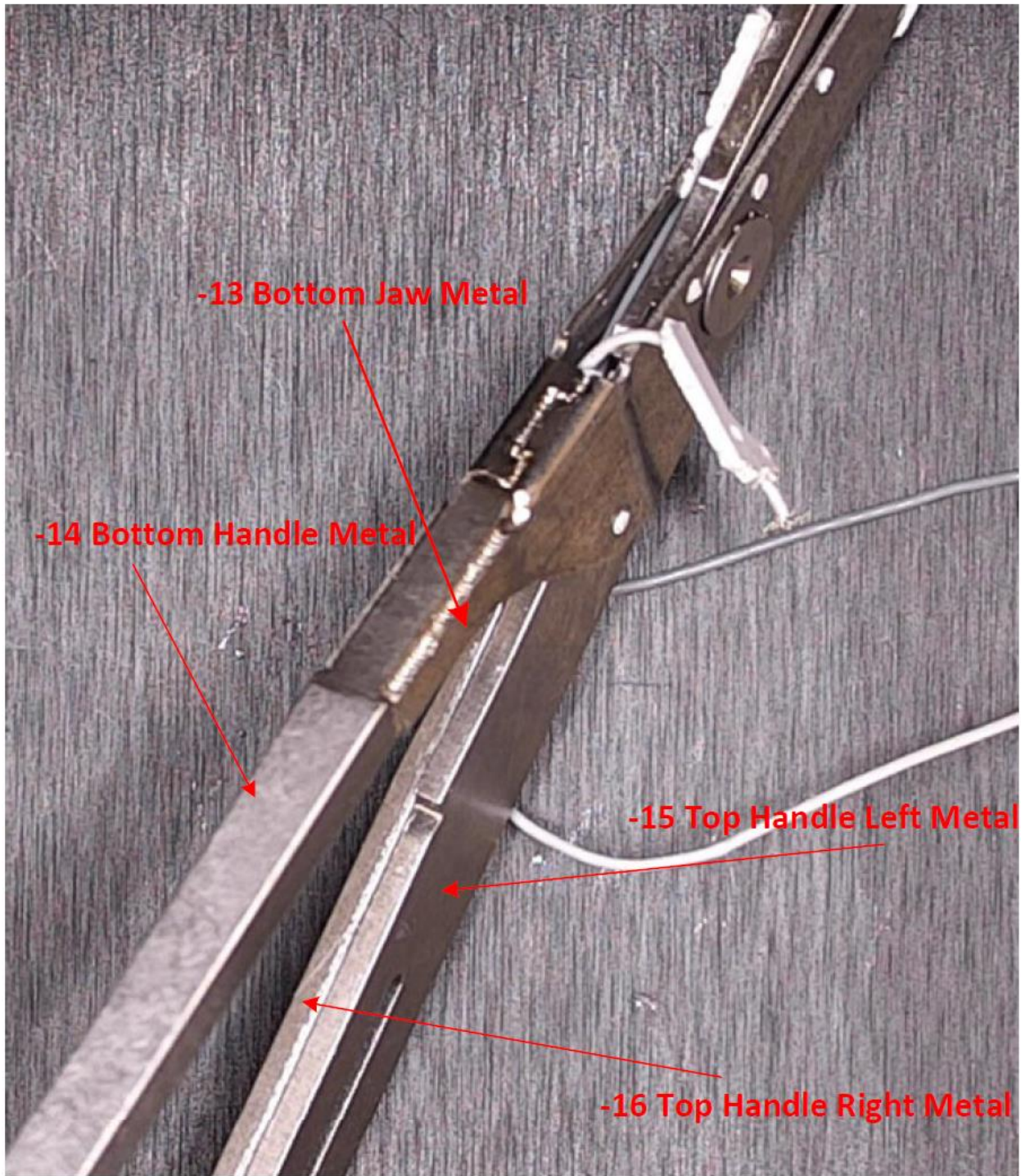


Figure A3: Component Reference Photographs (Handle Metal Components).

Appendix B: FTIR Results

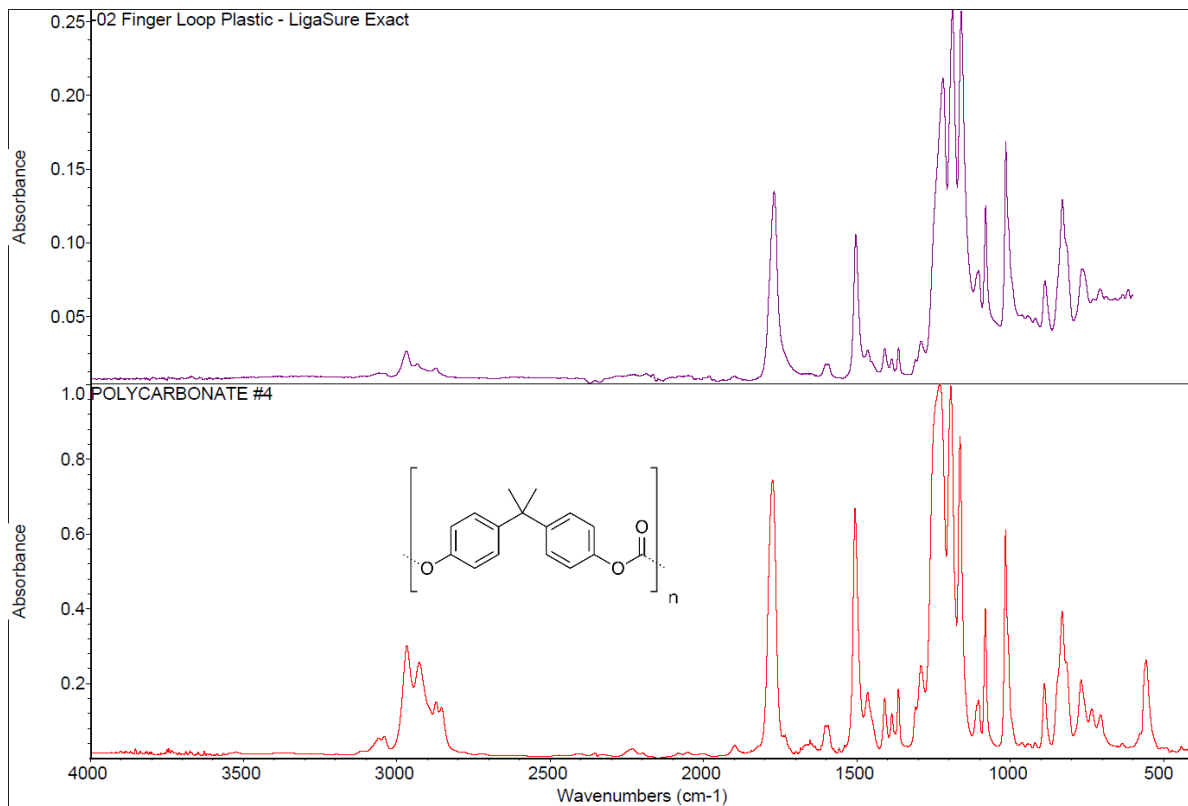


Figure B1: Polycarbonate Finger Loop Plastic. The IR absorption spectra of the finger loop plastic matches the expected peak structure for polycarbonate. Key peak structures for polycarbonate ID:

- C-O-C triplet $\sim 1150-1250\text{ cm}^{-1}$
- Ketone C=O stretch in carbonates at $\sim 1790\text{ cm}^{-1}$
- C-O stretch at $\sim 1000\text{ cm}^{-1}$
- Aromatic C=C at $\sim 1500\text{ cm}^{-1}$
- Aromatic C-H Stretch $\sim 3035\text{ cm}^{-1}$

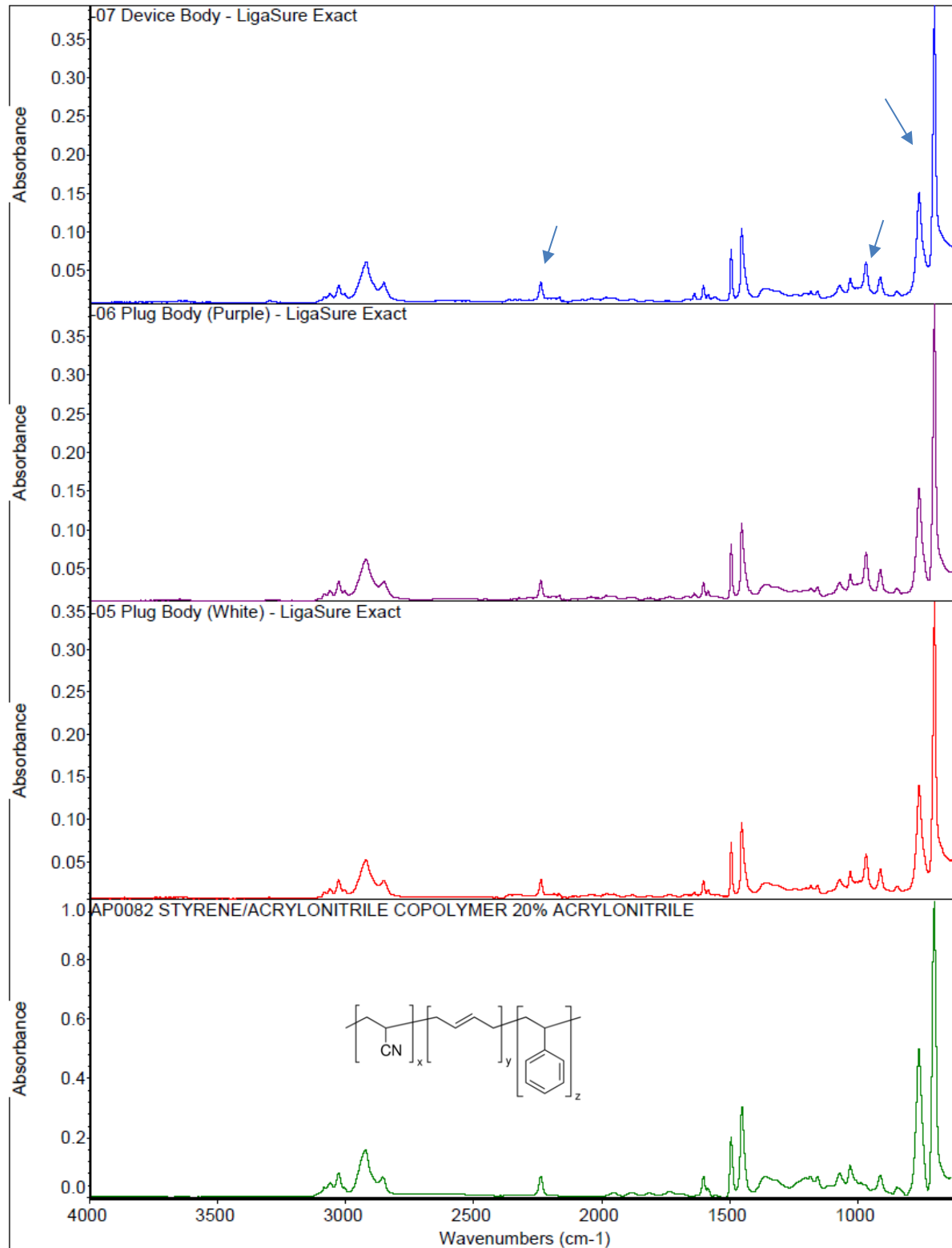


Figure B2: ABS Components. The device and plug body are made of ABS plastic. Key FTIR peaks for ABS identification: Nitrile N≡C absorption @2250cm⁻¹, vinylic hydrogen (butadiene) absorption peaks in the 930cm⁻¹ region, and the styrene (monsubstituted benzene C-H out of plane bending) peak @698cm⁻¹.

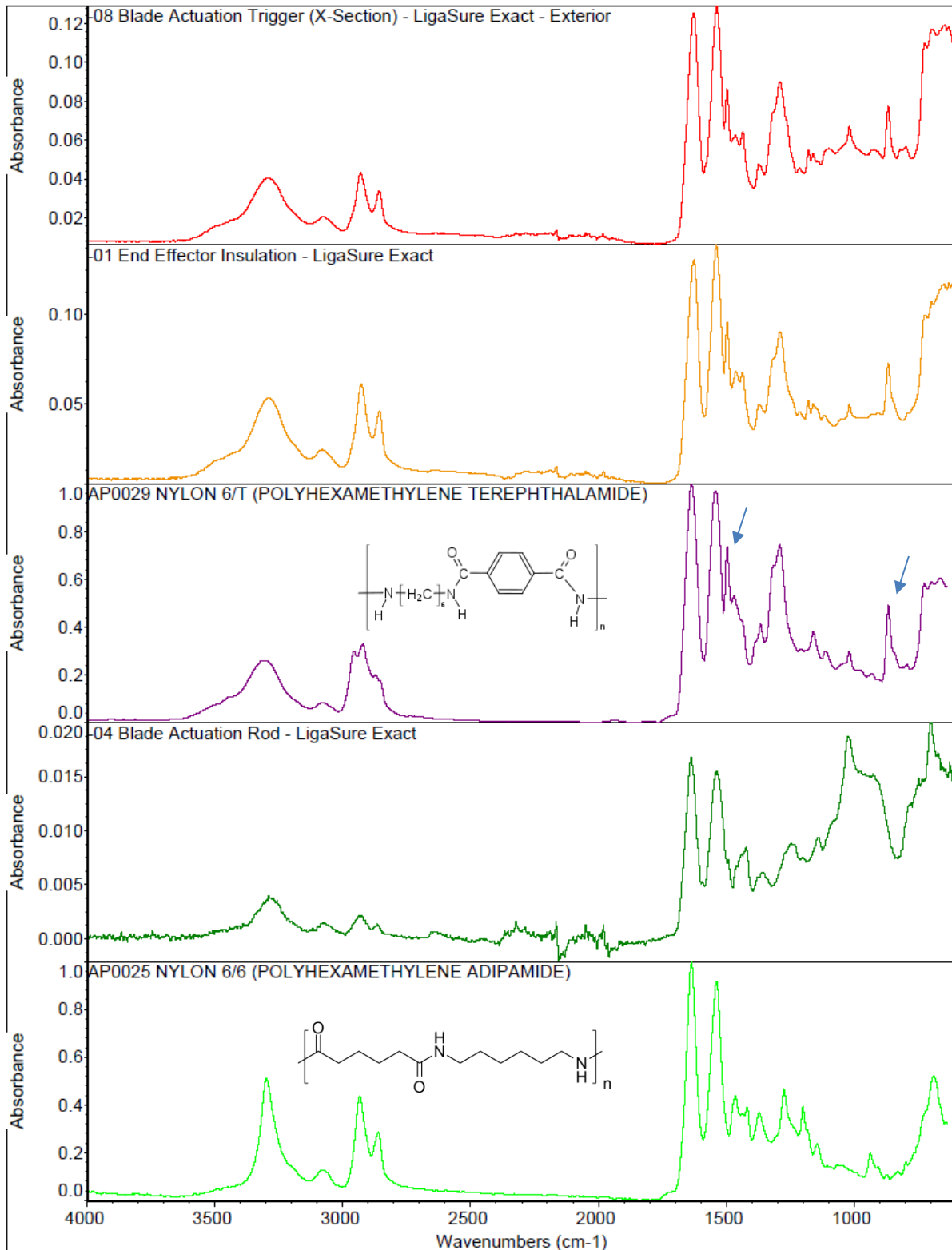


Figure B3: Polyamides. The end effector insulation and actuation trigger match a polyphthalamide reference. These spectra look similar to a regular nylon polyamide with the addition of 1496.5cm⁻¹ peak and aromatic C-H peak at 865.75cm⁻¹. The blade actuation rod is heavily glass filled, but closely matches a nylon polyamide

reference (High melting point suggests PA66). Key peaks for polyamide identification include: Amide bands @1530 & 1630 cm^{-1} , and N-H stretch at 3300 cm^{-1} .

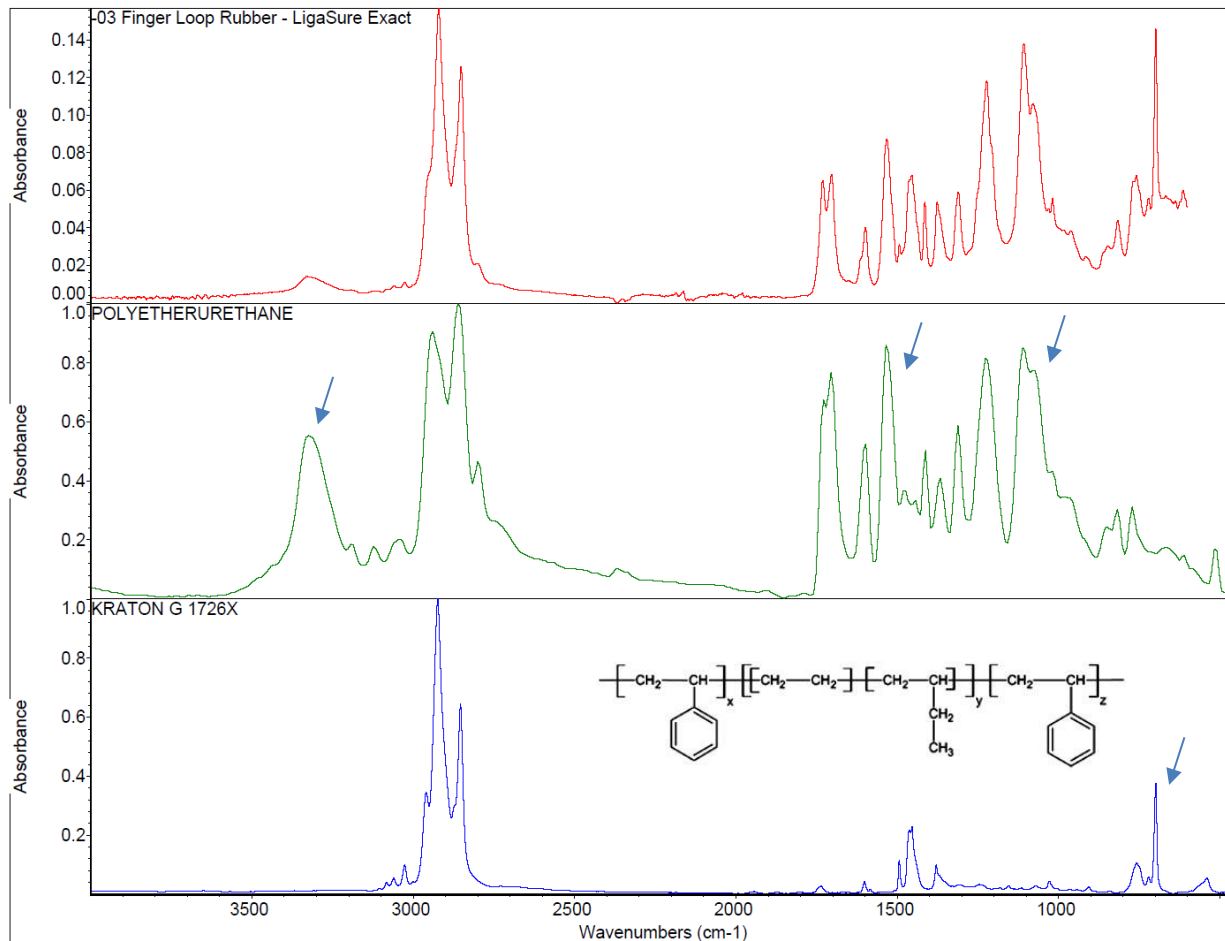


Figure B5: Polyurethane Finger Loop Rubber. The finger loop rubber is a polyether urethane with an additional SEBS/SBS soft segment. The urethane bonds can be recognized by N-H stretch in the 3300 cm^{-1} range, urethane linkage peak at $\sim 1533 \text{ cm}^{-1}$. The polyether segment produces a wide ether stretching peak at 1000-1100 cm^{-1} . Key peaks for identifying the SEBS include the 698 cm^{-1} styrene C-H peak and side group vibrations in the 1000 cm^{-1} region.

Appendix C: Alloy Result Details

Table C1: XRF Results – Stainless Steels

Element	-10 Electrodes	Nominal 316 SS	-12 End Effector/Handle Metal	-13 Bottom Jaw Metal	Nominal 301 SS
Fe	Balance	Balance	Balance	Balance	Balance
Cr	16.6%	16 - 18%	16.9%	16.6%	16 - 18%
Ni	10.4%	10 - 14%	7.6%	7.2%	6 - 8%
Mo	2.4%	2 - 3%	-	-	-
Mn	0.9%	<2%	0.9%	1.0%	<2%
Si, C, P, S	-	<1.2%	-	-	<1.2%

* Light element content was not measured.

Table C2: XRF Results – Steels Continued

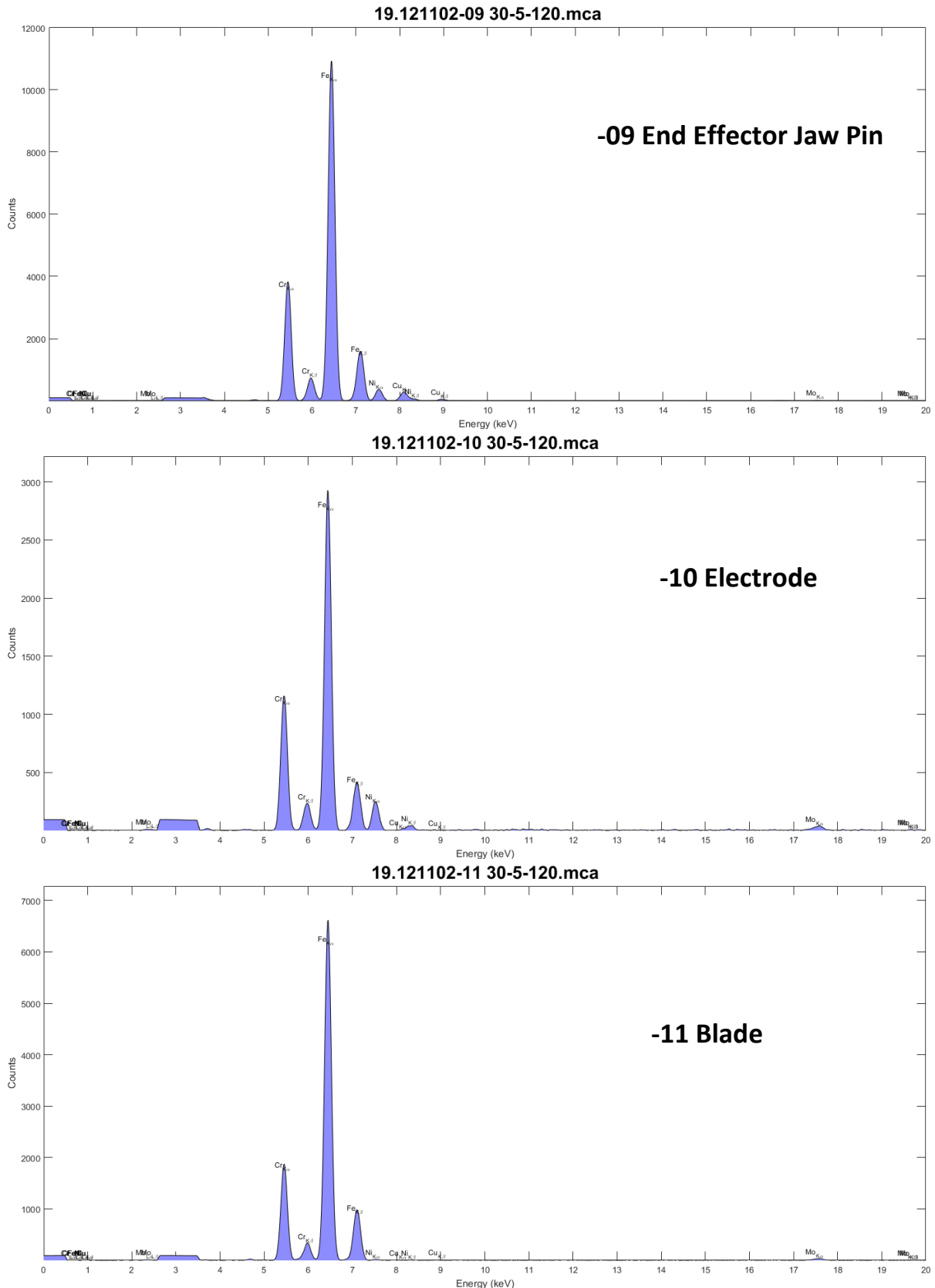
Element	-09 End Effector Jaw Pin	Nominal 17-4PH
Fe	Balance	Balance
Cr	14.9%	15-17.5%
Ni	4.48%	3-5%
Mo	0.15%	-
Mn	0.7%	<1%
Cu	3.2%	3-5%
Si, C, P, S	-	<1.2%

* Light element content was not measured.

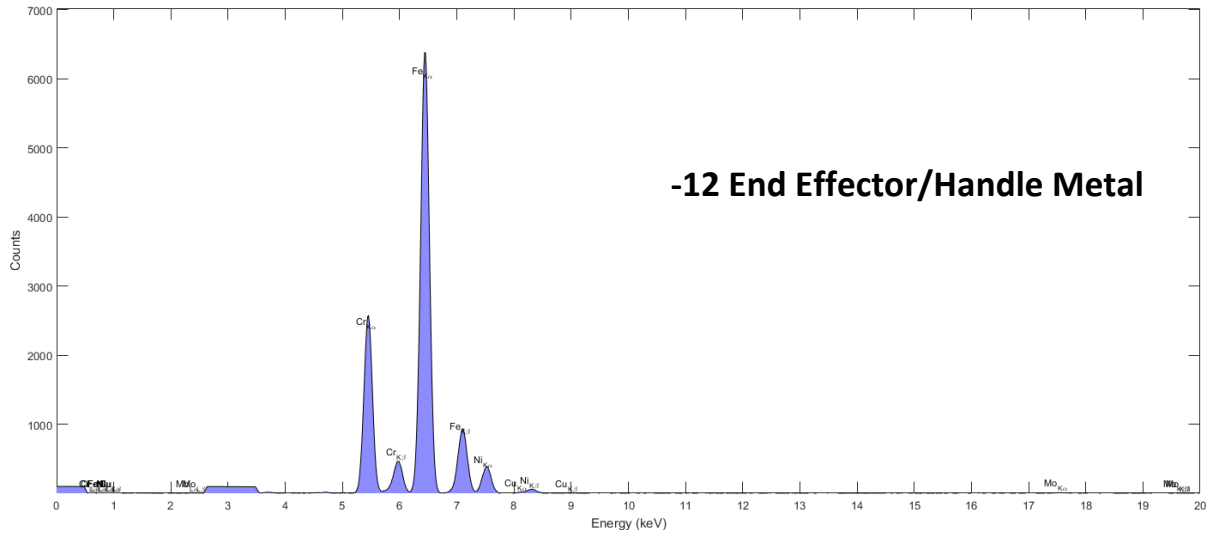
Table C3: XRF Results - Steels Continued

Element	-11 End Effector Blade	-14 Bottom Handle Metal	Nominal 422 SS	-15 Top Handle Left Metal	-16 Top Handle Right Metal	Nominal 409 SS
Fe	Balance	Balance	Balance	Balance	Balance	Balance
Cr	12.3%	12.4	11.0 – 13.0%	11.0%	10.9%	10.5-11.7%
Ni	0.8%	0.7%	0.5-1.0%	0.6%	0.7%	<0.5%
Mo	0.9%	-	0.75-1.25%	-	-	-
Mn	0.8%	0.8%	<1%	0.7%	0.8%	<1%
Si, C, P, S	-	-	<1.25%	-	-	<1.2%

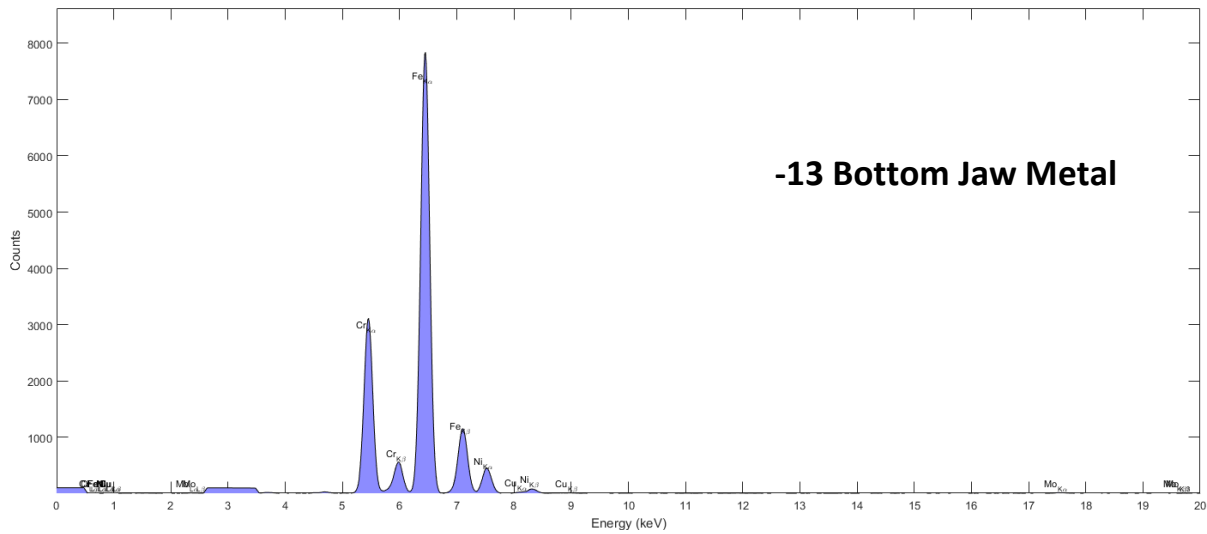
Figure CX: X-Ray Fluorescence (XRF) Spectra:



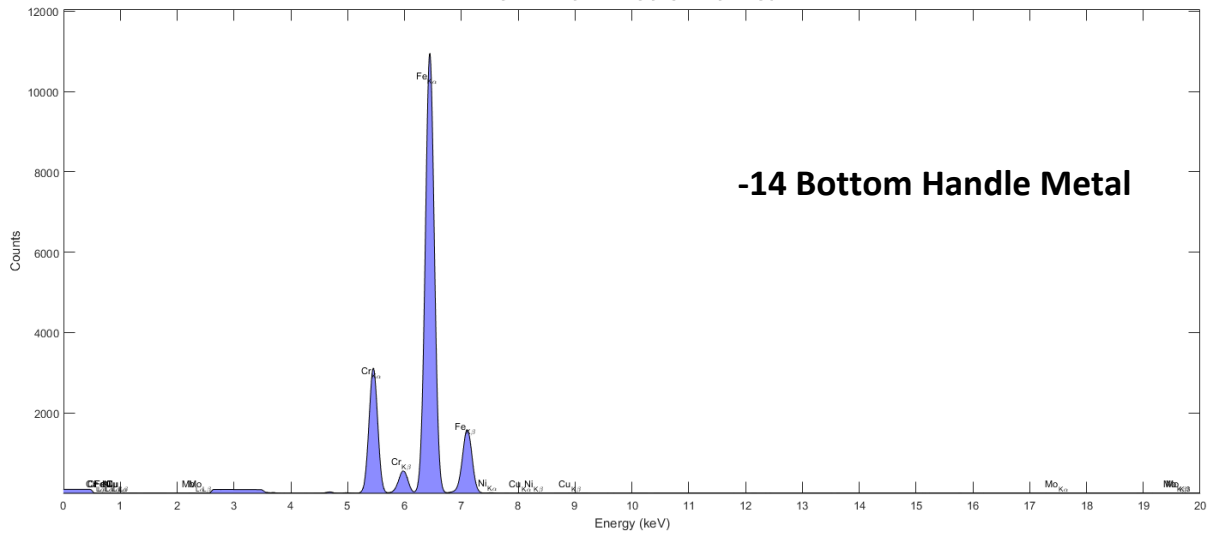
19.121102-12 30-5-120.mca



19.121102-13 30-5-120.mca



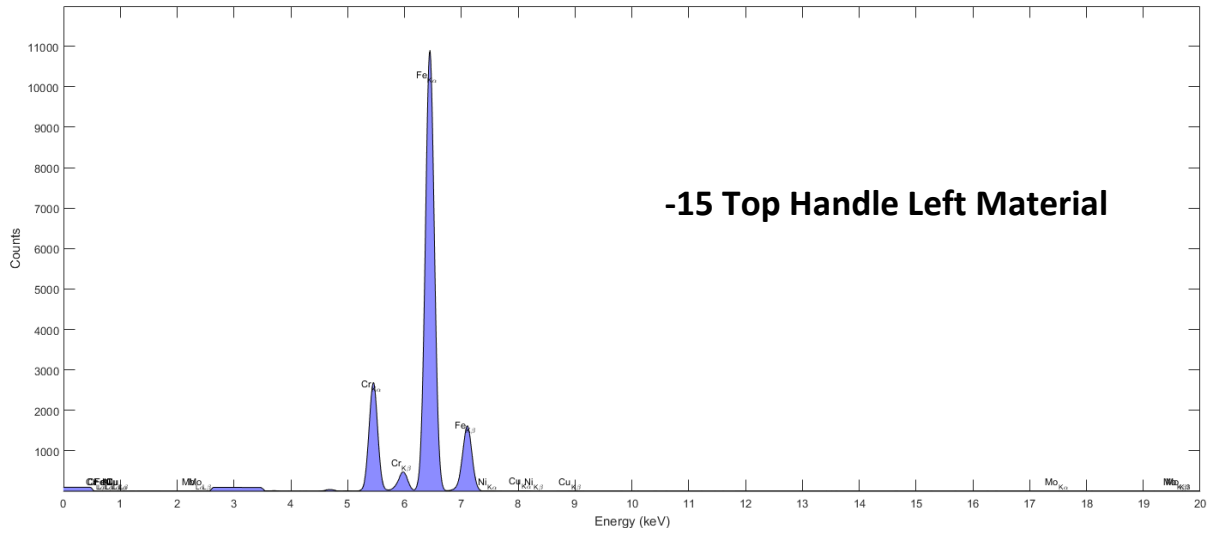
19.121102-14 30-5-120.mca



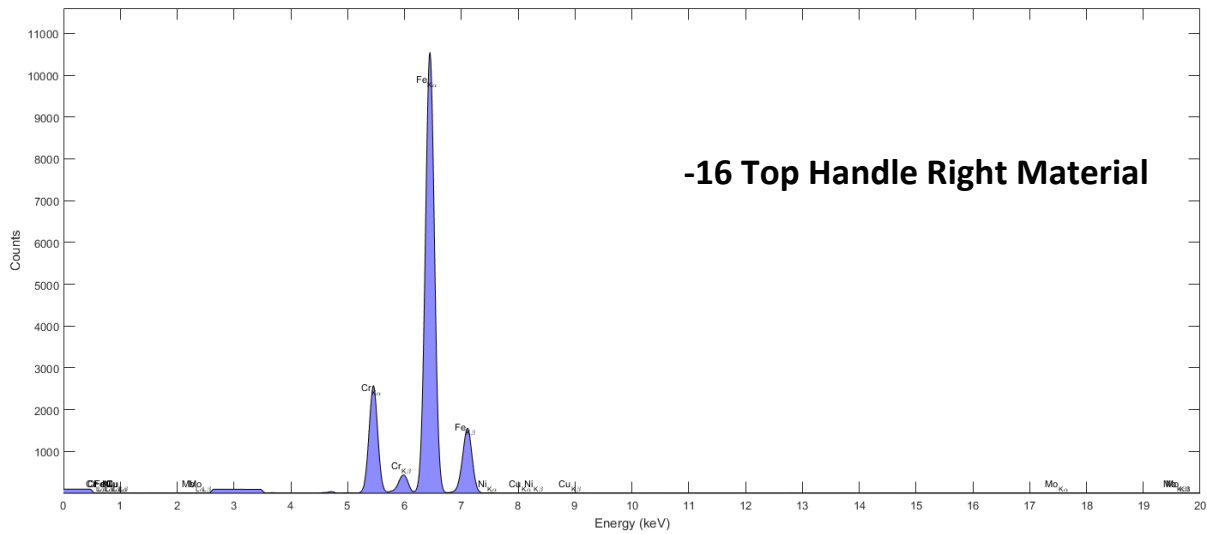
TEST REPORT

- APPENDIX A: REFERENCE PHOTOS
- APPENDIX B: FTIR RESULTS
- APPENDIX C: ALLOY RESULT DETAILS

19.121102-15 30-5-120.mca



19.121102-16 30-5-120.mca



The results presented in this report relate only to the samples tested.
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