SEMI F72-0214

Test Method for Auger Electron Spectroscopy (AES) Evaluation of Oxide Layer of Wetted Surfaces of Passivated 316L Stainless Steel Components

Test Report

Applicant Name: **Linlin Xie**

Product Name: **316L stainless steel products**

BEIJING JU RUI ZHONG BANG HT-TECH CO.LTD

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Test Report

Applicant Name:	**Linlin Xie**
Applicant Address:	**No.1261, Enterprise Development Service Center, Xiji Town, Tongzhou District, Beijing**
Manufacturer:	**Precess (Beijing)Semiconductor Co.,Ltd.**
Product description:	**316L stainless steel products**
Product Number:	**1**
Trademark:	**/**
Report Number:	**MG20241230-25596-2**
Date of Issue:	**2024.12.31**

Evaluated by: **Reviewed by:**

Xiuhao Jiang 2024.12.31 Lixia Yong 2024.12.31

signature **date** **signature** **date**

BEIJING JU RUI ZHONG BANG HT-TECH CO.LTD

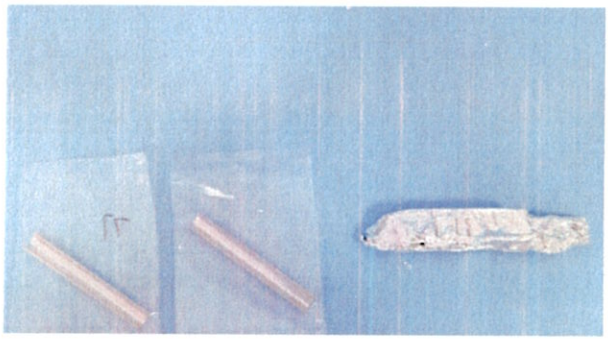
signature **date**

1. Description of Test Samples

1.1 General Description of the Product

316L stainless steel products

1.2 Sample Photo



2. Measurement Conditions

2.1 List of Test and Measurement Instruments

Equipment	Equipment type	Equipment number	Calibration date/ Next Calibration date
AES	PHI-5000Versa-ProbeIII-AESMOD 06-220 Electron Gun	SA-211	2024.05.17/2025.05.17

2.2 Referenced Standards

Test Items	Reference standards
Surface elemental composition Depth compositional profile of Cr,Fe,Ni,O,C Maximun Cr/Fe ratios，Cr/Fe ratio at 10Å	SEMI F72

2.3 Summary of Method

2.3.1 Acquire initial elemental survey and calculate elemental composition of 'as received' wetted surface.

2.3.2 Acquire a depth composition profile by ion etching to determine the relative abundance of carbon, oxygen, chromium, iron and nickel.

2.3.3 An initial survey spectrum extending from approximately 0 to 2000 eV.

2.3.4 A depth composition profile plot including Cr,Fe,Ni,O,C as a function of sputtering depth.

2.3.5 A table of the as-received surface elemental composition calculated from the initial survey spectrum.

2.3.6 A table of the oxide thickness, the carbon thickness, the chromium enriched layer thickness, the maximun of Cr/Fe ratio, the Cr/Fe ratio at 10Å, and the presence and thickness of the iron enriched oxide layer calculated from depth composition profile.

2.4 Acquisition parameters

Incident electron beam energy: 5KeV

Incident electron beam current: 10nA

Incident electron beam spot size: 20nm

Ion beam energy: 2KeV

Ion beam sputtering area: 2×2mm

SiO_2 etching rate: 5.2nm/min

The angle of the incident electron beam to the sample plane: 60°

Sample stage tilt angle: 30°

Scan area: 50×50μm

Vacuum：$<1.2\times10^{-6}$ Torr

Sample preparation: by the manufacturer

Analyst: mige02

Analysis date:2024.12.29

3. Test Result

3.1 Tabular summary of surface elemental composition

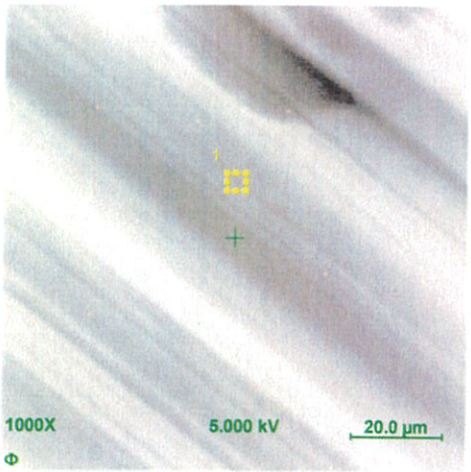
element	Atomic ratio	
	*	**
(C)	42.4	42.3
(Cr)	1.0	1.0
(Fe)	14.8	14.8
(Ni)	1.9	1.9
(O)	35.0	34.9
(Mo)	1.9	1.9
(S)	0.3	0.3
(P)	0.3	0.3
(N)	1.0	1.0
(Si)	1.4	~~
(Si(O))	~~	1.6
pollutant***	C, Si, N, S, P	

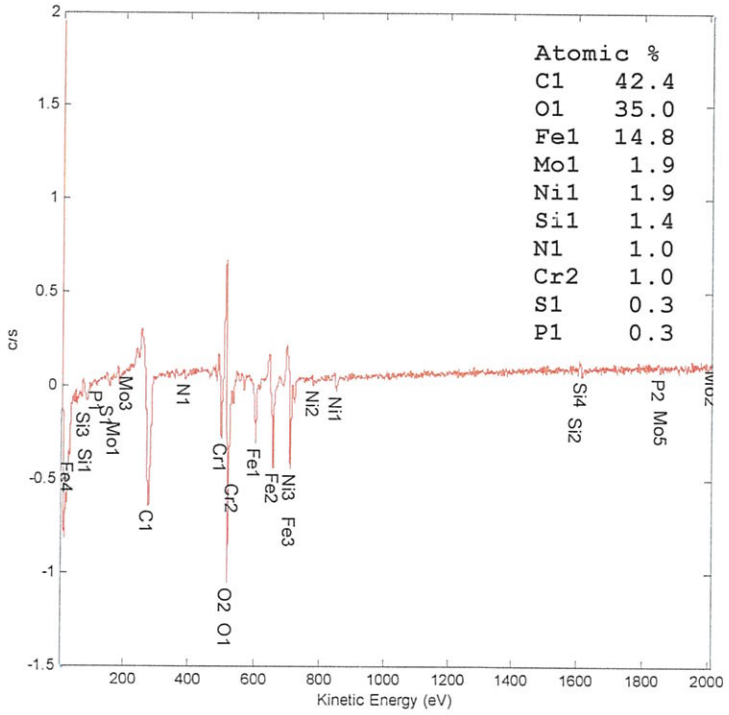
* ： The calculated percentage of Si is assumed to exist in the elemental state.

** ： The calculated percentage of Si is assumed to be in the form of an oxide.

*** ： Only elements with concentrations greater than 0.2% of atoms are listed.

3.2 Elemental survey spectrum





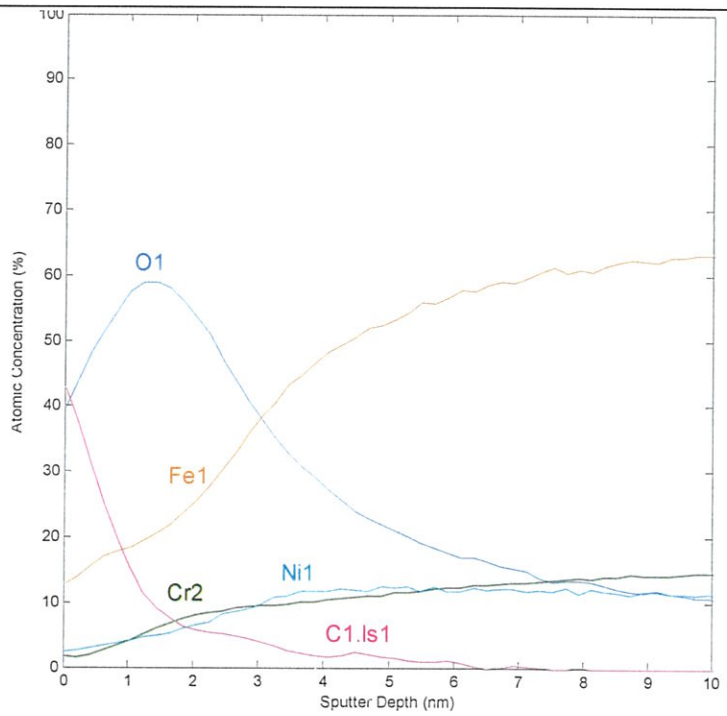
3.3 Tabular summary

Item	
maximun Cr/Fe ratio	0.31
Cr/Fe ratio at 10Å*	0.31
Oxide thickness	38.4Å
The corrected thickness of the oxide layer**	30.8Å
Carbon thickness	7.6Å
The thickness of individual iron oxides	/

*： The test depth is 10 A plus the thickness of layer C.

**： The modification of the oxide layer thickness takes into account the influence of the thickness of the C layer.

3.4 Depth profile of Cr,Fe,Ni,O,C



End of Test Report