

Appendix C: Chemical Compositions Obtained from XRF Measurements

Appendix C: Chemical Compositions Obtained from XRF Measurements

Table C1

Results of general chemical surface composition analysis performed by Energy Dispersive X-ray Fluorescence method for stainless steel 316L specimens.

	Before tests				After 720 h / 550 °C test				After 720 h / 700 °C test				After 2160 h / 550 °C test			
	side a		side b		side a		side b		side a		side b		side a		side b	
	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm
Fe	677900	9100	650600	9000	652000	9000	662500	9000	672200	9100	688500	9200	660700	9000	644200	8900
Cr	170600	3100	166900	3000	157100	2900	161400	3000	120100	2600	113700	2500	138200	2800	139700	2800
Ni	102300	2700	99600	2600	132800	3000	123300	2900	111800	2800	114100	2800	111200	2800	114900	2800
Mo	24200	200	22700	200	23600	200	23700	200	23100	200	23800	200	23600	200	23300	200
Mn	17600	1800	16200	1800	16400	1700	16800	1700	14900	1300	12500	1200	15900	1500	16000	1500
Si	3450	350	3420	340												
Sx					36200	1700	27100	1500	17700	1400	12800	1500	27000	1500	34500	1700
Px					1040	310	900	300	1540	250	1390	280	1630	280	1000	300
Cu	2900	320	2800	310	3570	400	3280	360	3130	350	3300	370	3150	350	3330	370
Pb	703	46	541	53	760	49	704	46	638	45	654	50	651	42	661	43
V	421	45	468	44	388	46	419	45	311	39	302	39	351	42	334	43
Au	268	15	256	15	229	26	255	22	296	15	286	16	233	22	220	23
Bi	145	22	202	20	171	21	167	21	92	19	159	17	135	20	121	20
Nb	136	9	129	8	127	8	127	8	112	7	113	7	128	8	126	8
Tl	125	20	66	25	166	15	139	17	81	23	86	24	125	21	130	20
Ca	93	42	98	41							136	30				
Hg	82	15	38	14	58	16	47	17	68	16	45	16	59	16	35	16
Sn	81	5	82	5	95	5	88	5	90	5	75	5	82	5	79	5
Cd	7,7	3,2														
Sb			26	4	18	4	18	4			24	4	24	4		
Zn					637	68	328	35					438	47	439	47
Ge					30	10	24	10			30	10	26	10	30	9
Sr					18	6										
K					79	30										
Co													6500	3200		
Ti									69	32	64	32				

Appendix C: Chemical Compositions Obtained from XRF Measurements

Table C2

Results of general chemical surface composition analysis performed by Energy Dispersive X-ray Fluorescence method for stainless steel EUROFER 97 specimens.

	Before tests				After 720 h / 550 °C test				After 720 h / 700 °C test				After 2160 h / 550 °C test			
	side a		side b		side a		side b		side a		side b		side a		side b	
	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm
Fe	816700	10000	794000	9900	868100	10300	866800	10300	876900	10400	862400	10300	858500	10300	850300	10200
Cr	86500	2200	86200	2200	45000	1600	50600	1700	60100	1800	60500	1800	39300	1500	42200	1500
W	10400	1100	10100	1100	12200	1200	13100	1300	12500	1200	12400	1200	12800	1300	12800	1300
Mn	9090	950	8240	950	7200	530	7980	590	9200	690	11300	700	7910	530	7590	510
Ta	1120	80	5400	580	852	56	990	60	716	56	623	56	797	58	878	57
V	1980	140	2060	140	1320	90	1550	110	1200	80	1140	80	1070	70	1210	80
Cu	3540	390	3780	420												
Cl	6440	320	2400	120												
Zn	5120	550					76	19								
K	1060	40	748	31	47	17	0	0	52	18						
Pb	965	63	908	59	880	57	928	60	886	58	930	60	778	51	770	51
Ca	529	59	530	59	174	19	240	27	111	20	92	19	179	20	169	19
Ni	205	25	244	25	186	25	267	26	127	25	98	26	150	26	195	27
Ta			991	79												
Sr			47	6												
Y			27	6												
Ti					100	22	76	24	155	23	152	26			76	23
Nb					4	1,2	8,1	1,2	3	1,3	2,8	1,2	3,5	1,3		
Sx					5090	470	10100	900					4060	370	6110	560
Ag							3,5	1,7								
Pd							2,8	1,2	2,6	1	2,9	1,2				
Cl									139	58						
Cu									42	20						
Bi											62	22			45	22
Mo													3,2	1,6	4,1	1,6

Appendix C: Chemical Compositions Obtained from XRF Measurements

Table C3

Results of general chemical surface composition analysis performed by Energy Dispersive X-ray Fluorescence method for Incoloy 800HT specimens.

	Before tests				After 720 h / 550 °C test				After 720 h / 700 °C test				After 2160 h / 550 °C test			
	side a		side b		side a		side b		side a		side b		side a		side b	
	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm
Fe	475100	7700	455900	7500	476600	7700	467900	7600	499700	7800	499200	7800	484600	7700	484100	7700
Ni	303500	4600	295900	4500	336000	4800	335500	4800	333700	4800	338600	4800	332700	4800	330600	4800
Cr	204100	3300	189400	3200	156800	2900	155700	2900	133100	2700	123600	2600	136800	2700	137600	2700
Ti	4200	470	3980	440	3030	340	3160	350	2770	310	2550	280	2810	310	2880	320
Mn	6700	2200	7800	2000	7800	1700	7700	1700	6900	1400	7100	1300	7800	1500	8000	1500
Si	2110	390	1940	420												
Pb	618	49	656	43	731	49	688	48	702	53	858	56	701	48	740	51
Mo	436	5	425	5	470	5	444	5	472	5	483	5	455	5	460	5
V	404	87	375	85	312	72	298	72	245	65	289	64	240	68	343	69
Cl	213	78	338	77												
Y	155	12	151	10	207	11	212	11	203	11	237	12	229	11	226	12
Ca	146	37	243	39	85	35	119	35	110	31	118	31	183	33	64	32
K	83	25	187	26							52	24				
Sr	61	9	73	8	90	9	85	9	66	10	151	8	75	10	59	11
Nb	26	3	22	3	16	4	12	4	13	4	12	4	15	4	17	4
Rb	48	16									54	9				
Sx					15300	1100	10400	900	2490	240	770	270	14500	1100	16300	1200
Zn					1250	130	379	41					465	50	588	63
Zr									24	12	50	9				
As											489	35				
Tl											122	11				
Th											69	8				
Se											25	7				
Br											19	8				
Sn													9	3,4		
Bi											62	22			45	22
Mo													3,2	1,6	4,1	1,6

Appendix C: Chemical Compositions Obtained from XRF Measurements

Table C5

Results of general chemical surface composition analysis performed by Energy Dispersive X-ray Fluorescence method for Inconel 625 specimens.

	Before tests				After 720 h / 550 °C test				After 720 h / 700 °C test				After 2160 h / 550 °C test			
	side a		side b		side a		side b		side a		side b		side a		side b	
	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm
Ni	656400	6700	648600	6700	710300	7000	692700	6900	712000	7000	712700	7000	694500	6900	699600	6900
Cr	214800	3400	205700	3400	184500	3200	193800	3300	151500	2900	153000	2900	156300	2900	161700	3000
Mo	77800	300	44100	200	80000	300	80600	300	83600	300	82000	300	77000	300	78300	300
Fe	40600	2200	38100	2200	41400	2300	42300	2300	44800	2300	45600	2400	44600	2300	44000	2300
Nb	30000	1100	30100	1100	29300	1100	28900	1100	31100	1100	30300	1100	29700	1100	30000	1100
Ti	1280	140	1220	140	1080	120	1120	120	832	92	759	84	970	110	1000	110
Sx			21700	2900					35500	4900	36700	4900	43400	4600	35400	4700
Ca	833	92	317	44	218	46	230	46	141	42	185	42	170	39	154	40
Zn	546	58			97	10	108	12	71	12	58	13	703	75	1480	160
K	230	29	143	27												
Hf	134	25											367	32		
Rb	50	10	59	12	75	12	77	11	42	13	71	11	47	13		
Ge	28	11	22	11					38	12	40	11	32	11		
Cd	22	6	18	5	17	6	14	5	17	5	24	6				
In	18	3			15	4	7,5	3,3	7,4	3,6	10	3,4	10	3,5		
Sb			14	4			12	4			9,7	4,3				
Y							1950	100								
K							77	34								
Sr							50	13			28	11				
Te									15	6						
Bi													67	21		

Appendix C: Chemical Compositions Obtained from XRF Measurements

Table C6

Results of general chemical surface composition analysis performed by Energy Dispersive X-ray Fluorescence method for MoNiCr specimens.

	Before tests				After 720 h / 550 °C test				After 720 h / 700 °C test				After 2160 h / 550 °C test			
	side a		side b		side a		side b		side a		side b		side a		side b	
	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm
Ni	866600	7700	890500	7800	909700	7900	907600	7900	912700	7900	908900	7900	904300	7900	905800	7900
Mo	150000	400	155500	400	149800	400	148800	400	156800	400	153500	400	149200	400	149800	400
Cr	57700	1800	58600	1800	38500	1500	38000	1400	36000	1400	36800	1400	39400	1500	40900	1500
Fe	7050	780	7050	780	5070	560	5050	560	5730	640	5690	630	5530	610	5600	620
Ti											89	23				
Nb	124	36	171	38	155	36	153	36	184	38	119	37	144	36	143	36
Ca	224	29	214	30	183	28	135	27	151	24	130	25	143	26	126	28
K	179	19	65	19	43	18										
Th	113	53	124	56	109	53	137	55	136	55			139	56		
Cd	45	6	53	6	84	6	36	6	54	6	40	6	38	6	30	5
Pt	17	8														
Ga	8,5	4,1														
Rb			33	12	34	10	33	11			42	9	28	12		
In			12	4	8,9	3,9	10	4							16	4
Sn					10	4,4	14	5	11	4					29	5
Zn									151	16	186	20	69	11	63	11
Sb									31	6	24	5				
Ta							61	20								
Ir							22	10								
Te									17	6					22	6
Ge											80	12	73	13	64	13

Appendix C: Chemical Compositions Obtained from XRF Measurements

Table C7

Results of general chemical surface composition analysis performed by Energy Dispersive X-ray Fluorescence method for MoNiCr sheet specimens.

	Before tests				After 720 h / 550 °C test				After 720 h / 700 °C test				After 2160 h / 550 °C test			
	side a		side b		side a		side b		side a		side b		side a		side b	
	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm
Ni	809300	7500	823800	7500	841100	7600	851800	7700	841700	7600	834400	7600	827100	7500	806300	7500
Mo	157600	400	163300	400	157500	400	158200	400	164300	400	159100	400	164700	400	159100	400
Cr	69700	2000	71300	2000	52100	1700	51600	1700	40500	1500	39900	1500	65600	1900	67300	1900
Fe	9800	1100	10200	1100	7940	880	7850	870	7860	870	7840	870	9200	1000	9500	1100
Mn			1910	750	1970	550	1990	550	2110	430	1900	420	2010	690	1870	710
Ti	1920	210	2040	230	1750	190	1660	180	1280	140	1310	150	1580	170	1680	190
Nb	118	38	157	39	186	38	144	38	168	39	132	38	152	39	142	38
Ca	231	33	226	33	137	30	161	30	217	29	187	28	162	30	197	27
K	176	18	100	17	200	19	148	19								
Au	151	13	121	15	117	14	130	12			73	25	142	14	136	15
Hg	59	27	72	29							65	28	68	29	56	28
Ge	59	14	77	15	61	14	47	15	85	13	79	13	59	15	67	14
Sb	56	6	51	6	65	6	65	6	85	7	64	6	59	6	63	6
Cd	28	6	28	6	23	6			40	6						
Rb	26	12					42	11	25	12						
Sn	16	5			17	4	28	5	12	4	16	4	20	5		
Te			24	6			20	6			17	6	16	6		
In					13	4	11	4			9,5	3,7			13	4
Zn									641	69	579	62				
Cd													14	7	34	6

Appendix C: Chemical Compositions Obtained from XRF Measurements

Table C8

Results of general chemical surface composition analysis performed by Energy Dispersive X-ray Fluorescence method for HN80MTY specimens.

	Before tests				After 720 h / 550 °C test				After 720 h / 700 °C test				After 2160 h / 550 °C test			
	side a		side b		side a		side b		side a		side b		side a		side b	
	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm	m/m _T ppm	σ ppm
Ni	880400	7800	846600	7600	904000	7900	878000	7800	903100	7900	906400	7900	889600	7800	904300	7900
Mo	134300	400	129600	400	127200	400	127700	400	135000	400	133900	400	126600	400	133500	400
Cr	69900	2000	68500	1900	51100	1700	52000	1700	49700	1700	48500	1600	50500	1700	49000	1600
Al	7000	2200	8000	2100	0	0	0	0	0	0	0	0	4700	1700	4300	1700
Ti	7800	870	7600	840	5420	600	5500	610	4790	530	4980	550	4990	550	4750	530
Fe	2110	230	2080	230	1620	180	1680	190	1780	200	2120	240	1630	180	1650	180
Nb	147	32	114	31	127	31	130	31	152	33	128	32	126	30	131	32
V	292	94	271	92	223	70	227	72	154	66	191	67	211	67	195	66
Au	262	16	264	15	246	15	229	15	311	18	289	18	306	15	290	16
Sb	150	8	120	7	119	7	137	7	156	8	153	8	154	8	146	8
Ca	149	29	153	32	117	29	79	33	173	29	106	29	0	0	84	30
Cd	115	6	90	6	84	7	83	5	33	6	45	5	38	5	74	5
Ge	87	15	81	15	53	15	76	14	78	17	84	16	50	15	71	16
Hg	78	29	86	27	110	25			76	31	99	29	102	25	62	29
Rb	31	11	33	10	45	10	29	10	36	10	36	10	32	11	31	11
In	12	4					14	4	14	4			11	4	8,5	3,7
Sn	9,6	3,8	11	4			20	4	24	4	14	4	11	4		
Px									3650	600	2180	610				
Zn									152	16	182	19	31	11	26	13
K					157	20	130	25								
Th							117	49								
Ba							71	26								
Cs							40	16								
Te							24	6	31	6					42	7
Sx									14600	7200						