FINAL REPORT

on

METAL-DETERGENT/CLEANER COMPATIBILITY

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to

AEROSPACE GUIDANCE AND METROLOGY CENTER
NEWARK AIR FORCE BASE

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by

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PART II

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Alloy 4750 Steel, 16-Hour Soak Test Data
(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
4750	22	Sonc-3	Versa Clean	120	low	2.0	0.0015
4750	23	Sonc-3	Versa Clean	120	low	2.0	0.0012
4750	24	Sonc-3	Versa Clean	120	low	2.0	0.0011
4750	25	Sonc-3	Versa Clean	155	nom-2	6.3	0.0017
4750	26	Sonc-3	Versa Clean	155	nom-2	6.3	0.0017
4750	27	Sonc-3	Versa Clean	155	nom-2	6.3	0.0015
4750	13	Sonc-3	PF Degreaser	120	as-rec.	100	0.0010
4750	14	Sonc-3	PF Degreaser	120	as-rec.	100	0.0004
4750	15	Sonc-3	PF Degreaser	120	as-rec.	100	0.0007
4750	16	Sonc-3	EZE 244	120	as-rec.	100	0.0010
4750	17	Sonc-3	EZE 244	120	as-rec.	100	0.0011
4750	18	Sonc-3	EZE 244	120	as-rec.	100	0.0008
4750	19	Sonc-3	EZE 244	155	as-rec.	100	0.0013
4750	20	Sonc-3	EZE 244	155	as-rec.	100	0.0014
4750	21	Sonc-3	EZE 244	155	as-rec.	100	0.0012
4750	28	Sonc-3	Brulin 815	120	low	4.8	0.0015
4750	29	Sonc-3	Brulin 815	120	low	4.8	0.0013
4750	30	Sonc-3	Brulin 815	120	low	4.8	0.0021
4750	31	Sonc-3	Brulin 815	155	high	9.1	0.0018
4750	32	Sonc-3	Brulin 815	155	high	9.1	0.0019
4750	33	Sonc-3	Brulin 815	155	high	9.1	0.0025
4750	34	Sonc-3	Intex 8125	120	low	5.0	0.0010
4750	35	Sonc-3	Intex 8125	120	low	5.0	0.0024
4750	36	Sonc-3	Intex 8125	120	low	5.0	0.0018
4750	37	Sonc-3	Intex 8125	155	high	10.0	0.0016
4750	38	Sonc-3	Intex 8125	155	high	10.0	0.0024
4750	39	Sonc-3	Intex 8125	155	high	10.0	0.0025
4750	40	Sonc-3	Intex 8284	120	low	5.0	0.0033
4750	41	Sonc-3	Intex 8284	120	low	5.0	0.0034
4750	42	Sonc-3	Intex 8284	120	low	5.0	0.0033
4750	43	Sonc-3	Intex 8284	155	low	5.0	0.0032
4750	44	Sonc-3	Intex 8284	155	low	5.0	0.0038
4750	45	Sonc-3	Intex 8284	155	low	5.0	0.0040
4750	46	Sonc-3	Kyzen	120	as-rec.	100	0.0008
4750	47	Sonc-3	Kyzen	120	as-rec.	100	0.0011
4750	48	Sonc-3	Kyzen	120	as-rec.	100	0.0014
4750	49	Sonc-3	Kyzen	155	as-rec.	100	0.0011
4750	50	Sonc-3	Kyzen	155	as-rec.	100	0.0023
4750	51	Sonc-3	Kyzen	155	as-rec.	100	0.0015
4750	4	Sonc-3	DI H2O	120	as-prep.	100	0.0010
4750	5	Sonc-3	DI H2O	120	as-prep.	100	0.0010
4750	6	Sonc-3	DI H2O	120	as-prep.	100	0.0010
4750	7	Sonc-3	DI H2O	155	as-prep.	100	0.0009
4750	8	Sonc-3	DI H2O	155	as-prep.	100	0.0012
4750	9	Sonc-3	DI H2O	155	as-prep.	100	0.0015
4750	10	Sonc-3	CFC 113	115	as-rec.	100	0.0010
4750	11	Sonc-3	CFC 113	115	as-rec.	100	0.0006
4750	12	Sonc-3	CFC 113	115	as-rec.	100	0.0005

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Alloy 4750 Steel, Sonication Test Data
(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
4750	52	Soak-3	Versa Clean	120	low	2.0	0.0016
4750	53	Soak-3	Versa Clean	120	low	2.0	0.0014
4750	54	Soak-3	Versa Clean	120	low	2.0	0.0011
4750	79	Soak-3	Versa Clean	155	nom-2	6.3	0.0016
4750	80	Soak-3	Versa Clean	155	nom-2	6.3	0.0014
4750	81	Soak-3	Versa Clean	155	nom-2	6.3	0.0015
4750	55	Soak-3	PF Degreaser	120	as-rec.	100	0.0006
4750	56	Soak-3	PF Degreaser	120	as-rec.	100	0.0010
4750	57	Soak-3	PF Degreaser	120	as-rec.	100	0.0010
4750	58	Soak-3	EZE 244	120	as-rec.	100	0.0015
4750	59	Soak-3	EZE 244	120	as-rec.	100	0.0012
4750	60	Soak-3	EZE 244	120	as-rec.	100	0.0014
4750	82	Soak-3	EZE 244	155	as-rec.	100	0.0010
4750	83	Soak-3	EZE 244	155	as-rec.	100	0.0005
4750	84	Soak-3	EZE 244	155	as-rec.	100	0.0008
4750	61	Soak-3	Brulin 815	120	low	4.8	0.0009
4750	62	Soak-3	Brulin 815	120	low	4.8	0.0013
4750	63	Soak-3	Brulin 815	120	low	4.8	0.0015
4750	85	Soak-3	Brulin 815	155	high	9.1	0.0008
4750	86	Soak-3	Brulin 815	155	high	9.1	0.0011
4750	87	Soak-3	Brulin 815	155	high	9.1	0.0007
4750	64	Soak-3	Intex 8125	120	high	20.0	0.0498
4750	65	Soak-3	Intex 8125	120	high	20.0	0.0526
4750	66	Soak-3	Intex 8125	120	high	20.0	0.0408
4750	88	Soak-3	Intex 8125	155	low	10.0	0.0343
4750	89	Soak-3	Intex 8125	155	low	10.0	0.0329
4750	90	Soak-3	Intex 8125	155	low	10.0	0.0344
4750	67	Soak-3	Intex 8284	120	low	5.0	0.0450
4750	68	Soak-3	Intex 8284	120	low	5.0	0.0413
4750	69	Soak-3	Intex 8284	120	low	5.0	0.0460
4750	91	Soak-3	Intex 8284	155	high	15.0	0.0759
4750	92	Soak-3	Intex 8284	155	high	15.0	0.0814
4750	93	Soak-3	Intex 8284	155	high	15.0	0.0653
4750	70	Soak-3	Kyzen	120	as-rec.	100	0.0005
4750	71	Soak-3	Kyzen	120	as-rec.	100	0.0003
4750	72	Soak-3	Kyzen	120	as-rec.	100	0.0002
4750	94	Soak-3	Kyzen	155	as-rec.	100	0.0011
4750	95	Soak-3	Kyzen	155	as-rec.	100	0.0008
4750	96	Soak-3	Kyzen	155	as-rec.	100	0.0007
4750	73	Soak-3	DI H2O	120	as-prep.	100	0.0002
4750	74	Soak-3	DI H2O	120	as-prep.	100	0.0002
4750	75	Soak-3	DI H2O	120	as-prep.	100	-0.0003
4750	97	Soak-3	DI H2O	155	as-prep.	100	0.0003
4750	98	Soak-3	DI H2O	155	as-prep.	100	0.0003
4750	99	Soak-3	DI H2O	155	as-prep.	100	0.0003
4750	76	Soak-3	CFC 113	115	as-rec.	100	0.0000
4750	77	Soak-3	CFC 113	115	as-rec.	100	0.0003
4750	78	Soak-3	CFC 113	115	as-rec.	100	-0.0001

Anodized AA 2017, 16-Hour Soak Test Data
(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
Anodized 2017	200	Soak-3	Versa Clean	120	low	2.0	0.0432
Anodized 2017	201	Soak-3	Versa Clean	120	low	2.0	0.0359
Anodized 2017	202	Soak-3	Versa Clean	120	low	2.0	0.0347
Anodized 2017	227	Soak-3	Versa Clean	155	nom-2	6.3	0.3645
Anodized 2017	228	Soak-3	Versa Clean	155	nom-2	6.3	0.3601
Anodized 2017	229	Soak-3	Versa Clean	155	nom-2	6.3	0.4153
Anodized 2017	203	Soak-3	PF Degreaser	120	as-rec.	100	-0.0045
Anodized 2017	204	Soak-3	PF Degreaser	120	as-rec.	100	-0.0039
Anodized 2017	205	Soak-3	PF Degreaser	120	as-rec.	100	-0.0030
Anodized 2017	206	Soak-3	EZE 244	120	as-rec.	100	0.1245
Anodized 2017	207	Soak-3	EZE 244	120	as-rec.	100	0.1117
Anodized 2017	208	Soak-3	EZE 244	120	as-rec.	100	0.1116
Anodized 2017	230	Soak-3	EZE 244	155	as-rec.	100	0.0552
Anodized 2017	231	Soak-3	EZE 244	155	as-rec.	100	0.0569
Anodized 2017	232	Soak-3	EZE 244	155	as-rec.	100	0.0622
Anodized 2017	209	Soak-3	Brulin 815	120	low	4.8	-0.0633
Anodized 2017	210	Soak-3	Brulin 815	120	low	4.8	-0.0558
Anodized 2017	211	Soak-3	Brulin 815	120	low	4.8	-0.0662
Anodized 2017	233	Soak-3	Brulin 815	155	high	9.1	-0.0486
Anodized 2017	234	Soak-3	Brulin 815	155	high	9.1	-0.0532
Anodized 2017	235	Soak-3	Brulin 815	155	high	9.1	-0.0503
Anodized 2017	212	Soak-3	Intex 8125	120	high	20.0	0.2487
Anodized 2017	213	Soak-3	Intex 8125	120	high	20.0	0.2440
Anodized 2017	214	Soak-3	Intex 8125	120	high	20.0	0.2561
Anodized 2017	236	Soak-3	Intex 8125	155	low	10.0	0.1818
Anodized 2017	237	Soak-3	Intex 8125	155	low	10.0	0.1866
Anodized 2017	238	Soak-3	Intex 8125	155	low	10.0	0.1620
Anodized 2017	215	Soak-3	Intex 8284	120	low	5.0	0.3384
Anodized 2017	216	Soak-3	Intex 8284	120	low	5.0	0.3412
Anodized 2017	217	Soak-3	Intex 8284	120	low	5.0	0.3395
Anodized 2017	239	Soak-3	Intex 8284	155	high	15.0	0.4506
Anodized 2017	240	Soak-3	Intex 8284	155	high	15.0	0.4403
Anodized 2017	241	Soak-3	Intex 8284	155	high	15.0	0.4243
Anodized 2017	218	Soak-3	Kyzen	120	as-rec.	100	-0.0225
Anodized 2017	219	Soak-3	Kyzen	120	as-rec.	100	-0.0211
Anodized 2017	220	Soak-3	Kyzen	120	as-rec.	100	-0.0198
Anodized 2017	242	Soak-3	Kyzen	155	as-rec.	100	-0.0340
Anodized 2017	243	Soak-3	Kyzen	155	as-rec.	100	-0.0330
Anodized 2017	251	Soak-3	Kyzen	155	as-rec.	100	-0.0304
Anodized 2017	221	Soak-3	DI H2O	120	as-prep.	100	-0.0518
Anodized 2017	222	Soak-3	DI H2O	120	as-prep.	100	-0.0490
Anodized 2017	223	Soak-3	DI H2O	120	as-prep.	100	-0.0508
Anodized 2017	252	Soak-3	DI H2O	155	as-prep.	100	-0.0516
Anodized 2017	253	Soak-3	DI H2O	155	as-prep.	100	-0.0515
Anodized 2017	254	Soak-3	DI H2O	155	as-prep.	100	-0.0494
Anodized 2017	224	Soak-3	CFC 113	115	as-rec.	100	-0.0121
Anodized 2017	225	Soak-3	CFC 113	115	as-rec.	100	-0.0129
Anodized 2017	226	Soak-3	CFC 113	115	as-rec.	100	-0.0145

Anodized AA 2017, Sonication Test Data
(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
Anodized 2017	170	Sonc-3	Versa Clean	120	low	2.0	-0.0094
Anodized 2017	171	Sonc-3	Versa Clean	120	low	2.0	-0.0077
Anodized 2017	172	Sonc-3	Versa Clean	120	low	2.0	-0.0035
Anodized 2017	173	Sonc-3	Versa Clean	155	nom-2	6.3	0.0014
Anodized 2017	174	Sonc-3	Versa Clean	155	nom-2	6.3	-0.0017
Anodized 2017	175	Sonc-3	Versa Clean	155	nom-2	6.3	0.0087
Anodized 2017	161	Sonc-3	PF Degreaser	120	as-rec.	100	-0.0052
Anodized 2017	162	Sonc-3	PF Degreaser	120	as-rec.	100	-0.0048
Anodized 2017	163	Sonc-3	PF Degreaser	120	as-rec.	100	-0.0046
Anodized 2017	164	Sonc-3	EZE 244	120	as-rec.	100	0.1411
Anodized 2017	165	Sonc-3	EZE 244	120	as-rec.	100	0.1005
Anodized 2017	166	Sonc-3	EZE 244	120	as-rec.	100	0.0689
Anodized 2017	167	Sonc-3	EZE 244	155	as-rec.	100	0.2748
Anodized 2017	168	Sonc-3	EZE 244	155	as-rec.	100	0.1757
Anodized 2017	169	Sonc-3	EZE 244	155	as-rec.	100	0.2899
Anodized 2017	176	Sonc-3	Brulin 815	120	low	4.8	0.0267
Anodized 2017	177	Sonc-3	Brulin 815	120	low	4.8	0.0161
Anodized 2017	178	Sonc-3	Brulin 815	120	low	4.8	0.0315
Anodized 2017	179	Sonc-3	Brulin 815	155	high	9.1	0.0479
Anodized 2017	180	Sonc-3	Brulin 815	155	high	9.1	0.0464
Anodized 2017	181	Sonc-3	Brulin 815	155	high	9.1	0.0465
Anodized 2017	182	Sonc-3	Intex 8125	120	low	5.0	-0.0006
Anodized 2017	183	Sonc-3	Intex 8125	120	low	5.0	0.0029
Anodized 2017	184	Sonc-3	Intex 8125	120	low	5.0	0.0005
Anodized 2017	185	Sonc-3	Intex 8125	155	high	10.0	0.0028
Anodized 2017	186	Sonc-3	Intex 8125	155	high	10.0	0.0019
Anodized 2017	187	Sonc-3	Intex 8125	155	high	10.0	-0.0014
Anodized 2017	188	Sonc-3	Intex 8284	120	low	5.0	0.0278
Anodized 2017	189	Sonc-3	Intex 8284	120	low	5.0	0.0303
Anodized 2017	190	Sonc-3	Intex 8284	120	low	5.0	0.0366
Anodized 2017	191	Sonc-3	Intex 8284	155	low	5.0	0.0698
Anodized 2017	192	Sonc-3	Intex 8284	155	low	5.0	0.0814
Anodized 2017	193	Sonc-3	Intex 8284	155	low	5.0	0.0759
Anodized 2017	194	Sonc-3	Kyzen	120	as-rec.	100	-0.0007
Anodized 2017	195	Sonc-3	Kyzen	120	as-rec.	100	-0.0033
Anodized 2017	196	Sonc-3	Kyzen	120	as-rec.	100	-0.0066
Anodized 2017	197	Sonc-3	Kyzen	155	as-rec.	100	-0.0097
Anodized 2017	198	Sonc-3	Kyzen	155	as-rec.	100	-0.0101
Anodized 2017	199	Sonc-3	Kyzen	155	as-rec.	100	-0.0115
Anodized 2017	152	Sonc-3	DI H2O	120	as-prep.	100	0.0012
Anodized 2017	153	Sonc-3	DI H2O	120	as-prep.	100	-0.0043
Anodized 2017	154	Sonc-3	DI H2O	120	as-prep.	100	-0.0013
Anodized 2017	155	Sonc-3	DI H2O	155	as-prep.	100	-0.0075
Anodized 2017	156	Sonc-3	DI H2O	155	as-prep.	100	-0.0036
Anodized 2017	157	Sonc-3	DI H2O	155	as-prep.	100	-0.0046
Anodized 2017	158	Sonc-3	CFC 113	115	as-rec.	100	-0.0036
Anodized 2017	159	Sonc-3	CFC 113	115	as-rec.	100	-0.0041
Anodized 2017	160	Sonc-3	CFC 113	115	as-rec.	100	-0.0041

Beryllium, 16-Hour Soak Test Data
(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
Beryllium	17A	Soak-3	Versa Clean	120	low	2.0	0.0003
Beryllium	17B	Soak-3	Versa Clean	120	low	2.0	0.0005
Beryllium	26A	Soak-3	Versa Clean	155	nom-2	6.3	0.0026
Beryllium	26B	Soak-3	Versa Clean	155	nom-2	6.3	0.0021
Beryllium	18A	Soak-3	PF Degreaser	120	as-rec	100	0.0000
Beryllium	18B	Soak-3	PF Degreaser	120	as-rec	100	0.0004
Beryllium	19A	Soak-3	EZE 244	120	as-rec	100	0.0007
Beryllium	19B	Soak-3	EZE 244	120	as-rec	100	0.0012
Beryllium	27A	Soak-3	EZE 244	155	as-rec	100	0.0021
Beryllium	27B	Soak-3	EZE 244	155	as-rec	100	0.0019
Beryllium	20A	Soak-3	Brulin 815	120	low	4.8	0.0018
Beryllium	20B	Soak-3	Brulin 815	120	low	4.8	0.0020
Beryllium	28A	Soak-3	Brulin 815	155	high	9.1	0.0065
Beryllium	28B	Soak-3	Brulin 815	155	high	9.1	0.0062
Beryllium	21A	Soak-3	Intex 8125	120	high	20.0	0.0019
Beryllium	21B	Soak-3	Intex 8125	120	high	20.0	0.0020
Beryllium	29A	Soak-3	Intex 8125	155	low	10.0	0.0038
Beryllium	29B	Soak-3	Intex 8125	155	low	10.0	0.0029
Beryllium	22A	Soak-3	Intex 8284	120	low	5.0	0.0242
Beryllium	22B	Soak-3	Intex 8284	120	low	5.0	0.0145
Beryllium	30A	Soak-3	Intex 8284	155	high	15.0	0.0420
Beryllium	30B	Soak-3	Intex 8284	155	high	15.0	0.0416
Beryllium	23A	Soak-3	Kyzen	120	as-rec	100	-0.0000
Beryllium	23B	Soak-3	Kyzen	120	as-rec	100	-0.0000
Beryllium	31A	Soak-3	Kyzen	155	as-rec	100	-0.0004
Beryllium	31B	Soak-3	Kyzen	155	as-rec	100	-0.0001
Beryllium	24A	Soak-3	DI H2O	120	as-prep	100	0.0006
Beryllium	24B	Soak-3	DI H2O	120	as-prep	100	0.0004
Beryllium	32A	Soak-3	DI H2O	155	as-prep	100	0.0007
Beryllium	32B	Soak-3	DI H2O	155	as-prep	100	0.0009
Beryllium	25A	Soak-3	CFC 113	115	as-rec	100	-0.0002
Beryllium	25B	Soak-3	CFC 113	115	as-rec	100	-0.0005

Beryllium, Sonication Test Data
(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
Beryllium	07A	Sonc-3	Versa Clean	120	low	2.0	0.0021
Beryllium	07B	Sonc-3	Versa Clean	120	low	2.0	0.0016
Beryllium	08A	Sonc-3	Versa Clean	155	nom-2	6.3	0.0013
Beryllium	08B	Sonc-3	Versa Clean	155	nom-2	6.3	0.0013
Beryllium	04A	Sonc-3	PF Degreaser	120	as-rec	100	0.0006
Beryllium	04B	Sonc-3	PF Degreaser	120	as-rec	100	0.0008
Beryllium	05A	Sonc-3	EZE 244	120	as-rec	100	0.0000
Beryllium	05B	Sonc-3	EZE 244	120	as-rec	100	0.0004
Beryllium	06A	Sonc-3	EZE 244	155	as-rec	100	0.0009
Beryllium	06B	Sonc-3	EZE 244	155	as-rec	100	0.0007
Beryllium	09A	Sonc-3	Brulin 815	120	low	4.8	0.0031
Beryllium	09B	Sonc-3	Brulin 815	120	low	4.8	0.0028
Beryllium	10A	Sonc-3	Brulin 815	155	high	9.1	-0.0004
Beryllium	10B	Sonc-3	Brulin 815	155	high	9.1	0.0014
Beryllium	11A	Sonc-3	Intex 8125	120	low	5.0	0.0006
Beryllium	11B	Sonc-3	Intex 8125	120	low	5.0	0.0003
Beryllium	12A	Sonc-3	Intex 8125	155	high	10.0	0.0003
Beryllium	12B	Sonc-3	Intex 8125	155	high	10.0	0.0007
Beryllium	13A	Sonc-3	Intex 8284	120	low	5.0	0.0008
Beryllium	13B	Sonc-3	Intex 8284	120	low	5.0	-0.0002
Beryllium	14A	Sonc-3	Intex 8284	155	low	5.0	0.0021
Beryllium	14B	Sonc-3	Intex 8284	155	low	5.0	0.0020
Beryllium	15A	Sonc-3	Kyzen	120	as-rec	100	0.0018
Beryllium	15B	Sonc-3	Kyzen	120	as-rec	100	0.0018
Beryllium	16A	Sonc-3	Kyzen	155	as-rec	100	0.0008
Beryllium	16B	Sonc-3	Kyzen	155	as-rec	100	0.0012
Beryllium	01A	Sonc-3	DI H2O	120	as-prep	100	0.0012
Beryllium	01B	Sonc-3	DI H2O	120	as-prep	100	0.0003
Beryllium	02A	Sonc-3	DI H2O	155	as-prep	100	0.0008
Beryllium	02B	Sonc-3	DI H2O	155	as-prep	100	0.0009
Beryllium	03A	Sonc-3	CFC 113	115	as-rec	100	0.0009
Beryllium	03B	Sonc-3	CFC 113	115	as-rec	100	0.0013

Cartridge Brass, 16-Hour Soak Test Data
(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA260	52	Soak-3	Versa Clean	120	low	2.0	0.0179
CDA260	53	Soak-3	Versa Clean	120	low	2.0	0.0185
CDA260	54	Soak-3	Versa Clean	120	low	2.0	0.0181
CDA260	79	Soak-3	Versa Clean	155	nom-2	6.3	0.0676
CDA260	80	Soak-3	Versa Clean	155	nom-2	6.3	0.0688
CDA260	81	Soak-3	Versa Clean	155	nom-2	6.3	0.0688
CDA260	55	Soak-3	PF Degreaser	120	as-rec.	100	0.0009
CDA260	56	Soak-3	PF Degreaser	120	as-rec.	100	0.0010
CDA260	57	Soak-3	PF Degreaser	120	as-rec.	100	0.0009
CDA260	58	Soak-3	EZE 244	120	as-rec.	100	0.0670
CDA260	59	Soak-3	EZE 244	120	as-rec.	100	0.0659
CDA260	60	Soak-3	EZE 244	120	as-rec.	100	0.0616
CDA260	82	Soak-3	EZE 244	155	as-rec.	100	0.0327
CDA260	83	Soak-3	EZE 244	155	as-rec.	100	0.0336
CDA260	84	Soak-3	EZE 244	155	as-rec.	100	0.0337
CDA260	61	Soak-3	Brulin 815	120	low	4.8	0.0508
CDA260	62	Soak-3	Brulin 815	120	low	4.8	0.0468
CDA260	63	Soak-3	Brulin 815	120	low	4.8	0.0485
CDA260	85	Soak-3	Brulin 815	155	high	9.1	0.0441
CDA260	86	Soak-3	Brulin 815	155	high	9.1	0.0517
CDA260	87	Soak-3	Brulin 815	155	high	9.1	0.0522
CDA260	64	Soak-3	Intex 8125	120	high	20.0	0.0063
CDA260	65	Soak-3	Intex 8125	120	high	20.0	0.0064
CDA260	66	Soak-3	Intex 8125	120	high	20.0	0.0062
CDA260	88	Soak-3	Intex 8125	155	low	10.0	0.0105
CDA260	89	Soak-3	Intex 8125	155	low	10.0	0.0114
CDA260	90	Soak-3	Intex 8125	155	low	10.0	0.0108
CDA260	67	Soak-3	Intex 8284	120	low	5.0	0.0301
CDA260	68	Soak-3	Intex 8284	120	low	5.0	0.0283
CDA260	69	Soak-3	Intex 8284	120	low	5.0	0.0263
CDA260	91	Soak-3	Intex 8284	155	high	15.0	0.0624
CDA260	92	Soak-3	Intex 8284	155	high	15.0	0.0595
CDA260	93	Soak-3	Intex 8284	155	high	15.0	0.0632
CDA260	70	Soak-3	Kyzen	120	as-rec.	100	-0.0090
CDA260	71	Soak-3	Kyzen	120	as-rec.	100	-0.0155
CDA260	72	Soak-3	Kyzen	120	as-rec.	100	-0.0182
CDA260	94	Soak-3	Kyzen	155	as-rec.	100	0.0024
CDA260	95	Soak-3	Kyzen	155	as-rec.	100	0.0035
CDA260	96	Soak-3	Kyzen	155	as-rec.	100	0.0038
CDA260	73	Soak-3	DI H2O	120	as-prep.	100	0.0013
CDA260	74	Soak-3	DI H2O	120	as-prep.	100	0.0016
CDA260	75	Soak-3	DI H2O	120	as-prep.	100	0.0019
CDA260	97	Soak-3	DI H2O	155	as-prep.	100	0.0011
CDA260	98	Soak-3	DI H2O	155	as-prep.	100	0.0008
CDA260	99	Soak-3	DI H2O	155	as-prep.	100	0.0012
CDA260	76	Soak-3	CFC 113	115	as-rec.	100	0.0010
CDA260	77	Soak-3	CFC 113	115	as-rec.	100	0.0007
CDA260	78	Soak-3	CFC 113	115	as-rec.	100	0.0008

Cartridge Brass (CDA260), Sonication Test Data

(Experiment No. 3)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA260	22	Sonc-3	Versa Clean	120	low	2.0	0.0020
CDA260	23	Sonc-3	Versa Clean	120	low	2.0	0.0026
CDA260	24	Sonc-3	Versa Clean	120	low	2.0	0.0017
CDA260	25	Sonc-3	Versa Clean	155	nom-2	6.3	0.0039
CDA260	26	Sonc-3	Versa Clean	155	nom-2	6.3	0.0033
CDA260	27	Sonc-3	Versa Clean	155	nom-2	6.3	0.0027
CDA260	13	Sonc-3	PF Degreaser	120	as-rec.	100	0.0010
CDA260	14	Sonc-3	PF Degreaser	120	as-rec.	100	0.0009
CDA260	15	Sonc-3	PF Degreaser	120	as-rec.	100	0.0012
CDA260	16	Sonc-3	EZE 244	120	as-rec.	100	0.0043
CDA260	17	Sonc-3	EZE 244	120	as-rec.	100	0.0056
CDA260	18	Sonc-3	EZE 244	120	as-rec.	100	0.0043
CDA260	19	Sonc-3	EZE 244	155	as-rec.	100	0.0042
CDA260	20	Sonc-3	EZE 244	155	as-rec.	100	0.0037
CDA260	21	Sonc-3	EZE 244	155	as-rec.	100	0.0039
CDA260	28	Sonc-3	Brulin 815	120	low	4.8	0.0036
CDA260	29	Sonc-3	Brulin 815	120	low	4.8	0.0031
CDA260	30	Sonc-3	Brulin 815	120	low	4.8	0.0033
CDA260	31	Sonc-3	Brulin 815	155	high	9.1	0.0031
CDA260	32	Sonc-3	Brulin 815	155	high	9.1	0.0036
CDA260	33	Sonc-3	Brulin 815	155	high	9.1	0.0043
CDA260	34	Sonc-3	Intex 8125	120	low	5.0	0.0020
CDA260	35	Sonc-3	Intex 8125	120	low	5.0	0.0017
CDA260	36	Sonc-3	Intex 8125	120	low	5.0	0.0017
CDA260	37	Sonc-3	Intex 8125	155	high	10.0	0.0041
CDA260	38	Sonc-3	Intex 8125	155	high	10.0	0.0027
CDA260	39	Sonc-3	Intex 8125	155	high	10.0	0.0030
CDA260	40	Sonc-3	Intex 8284	120	low	5.0	0.0030
CDA260	41	Sonc-3	Intex 8284	120	low	5.0	0.0043
CDA260	42	Sonc-3	Intex 8284	120	low	5.0	0.0037
CDA260	43	Sonc-3	Intex 8284	155	low	5.0	0.0042
CDA260	44	Sonc-3	Intex 8284	155	low	5.0	0.0035
CDA260	45	Sonc-3	Intex 8284	155	low	5.0	0.0015
CDA260	46	Sonc-3	Kyzen	120	as-rec.	100	0.0007
CDA260	47	Sonc-3	Kyzen	120	as-rec.	100	0.0009
CDA260	48	Sonc-3	Kyzen	120	as-rec.	100	0.0006
CDA260	49	Sonc-3	Kyzen	155	as-rec.	100	-0.0007
CDA260	50	Sonc-3	Kyzen	155	as-rec.	100	0.0003
CDA260	51	Sonc-3	Kyzen	155	as-rec.	100	0.0005
CDA260	4	Sonc-3	DI H2O	120	as-prep.	100	0.0003
CDA260	5	Sonc-3	DI H2O	120	as-prep.	100	0.0008
CDA260	6	Sonc-3	DI H2O	120	as-prep.	100	0.0007
CDA260	7	Sonc-3	DI H2O	155	as-prep.	100	0.0009
CDA260	8	Sonc-3	DI H2O	155	as-prep.	100	0.0008
CDA260	9	Sonc-3	DI H2O	155	as-prep.	100	0.0004
CDA260	10	Sonc-3	CFC 113	115	as-rec.	100	0.0007
CDA260	11	Sonc-3	CFC 113	115	as-rec.	100	0.0007
CDA260	12	Sonc-3	CFC 113	115	as-rec.	100	0.0004

AA 6061, 16-Hour Soak Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
AA6061	4	Soak-4	Versa Clean	120	nom-2	6.3	0.48419
AA6061	5	Soak-4	Versa Clean	120	nom-2	6.3	0.47802
AA6061	6	Soak-4	Versa Clean	120	nom-2	6.3	0.47315
AA6061	7	Soak-4	PF Degreaser	120	as-rec	100	0.00403
AA6061	8	Soak-4	PF Degreaser	120	as-rec	100	0.00449
AA6061	9	Soak-4	PF Degreaser	120	as-rec	100	0.00375
AA6061	10	Soak-4	EZE 244	120	as-rec	100	0.13870
AA6061	11	Soak-4	EZE 244	120	as-rec	100	0.18842
AA6061	12	Soak-4	EZE 244	120	as-rec	100	0.15707
AA6061	13	Soak-4	Brulin 815	120	high	9.1	0.00402
AA6061	14	Soak-4	Brulin 815	120	high	9.1	0.00533
AA6061	15	Soak-4	Brulin 815	120	high	9.1	0.00496
AA6061	16	Soak-4	Intex 8125	120	high	20	0.21816
AA6061	17	Soak-4	Intex 8125	120	high	20	0.22208
AA6061	18	Soak-4	Intex 8125	120	high	20	0.22275
AA6061	19	Soak-4	Intex 8284	120	high	15	0.03193
AA6061	20	Soak-4	Intex 8284	120	high	15	0.02774
AA6061	21	Soak-4	Intex 8284	120	high	15	0.03487
AA6061	22	Soak-4	Kyzen	120	as-rec	100	0.00377
AA6061	23	Soak-4	Kyzen	120	as-rec	100	0.00298
AA6061	24	Soak-4	Kyzen	120	as-rec	100	0.00242
AA6061	25	Soak-4	DI H2O	120	as-prep	100	-0.00375
AA6061	26	Soak-4	DI H2O	120	as-prep	100	-0.01480
AA6061	27	Soak-4	DI H2O	120	as-prep	100	-0.00309
AA6061	28	Soak-4	CFC 113	115	as-rec	100	0.00000
AA6061	29	Soak-4	CFC 113	115	as-rec	100	-0.00107
AA6061	30	Soak-4	CFC 113	115	as-rec	100	-0.00162

AA 6061, Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
AA6061	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.02519
AA6061	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.02901
AA6061	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.03096
AA6061	34	Sonc-4	PF Degreaser	120	as-rec	100	0.00054
AA6061	35	Sonc-4	PF Degreaser	120	as-rec	100	0.00214
AA6061	36	Sonc-4	PF Degreaser	120	as-rec	100	0.00161
AA6061	37	Sonc-4	EZE 244	120	as-rec	100	0.03392
AA6061	38	Sonc-4	EZE 244	120	as-rec	100	0.02886
AA6061	39	Sonc-4	EZE 244	120	as-rec	100	0.02274
AA6061	40	Sonc-4	Brulin 815	120	high	9.1	0.00243
AA6061	41	Sonc-4	Brulin 815	120	high	9.1	0.00107
AA6061	42	Sonc-4	Brulin 815	120	high	9.1	0.00150
AA6061	43	Sonc-4	Intex 8125	120	high	10	0.00386
AA6061	44	Sonc-4	Intex 8125	120	high	10	0.00433
AA6061	45	Sonc-4	Intex 8125	120	high	10	0.00619
AA6061	46	Sonc-4	Intex 8284	120	high	15	0.00608
AA6061	47	Sonc-4	Intex 8284	120	high	15	0.00599
AA6061	48	Sonc-4	Intex 8284	120	high	15	0.00670
AA6061	49	Sonc-4	Kyzen	120	as-rec	100	0.00292
AA6061	50	Sonc-4	Kyzen	120	as-rec	100	0.00241
AA6061	51	Sonc-4	Kyzen	120	as-rec	100	0.00243
AA6061	52	Sonc-4	DI H2O	120	as-prep	100	0.00187
AA6061	53	Sonc-4	DI H2O	120	as-prep	100	0.00256
AA6061	54	Sonc-4	DI H2O	120	as-prep	100	0.00266
AA6061	55	Sonc-4	CFC 113	115	as-rec	100	0.00257
AA6061	56	Sonc-4	CFC 113	115	as-rec	100	0.00213
AA6061	57	Sonc-4	CFC 113	115	as-rec	100	0.00215

Beryllium Copper (CDA172), 16-Hour Soak Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA172	4	Soak-4	Versa Clean	120	nom-2	6.3	0.01736
CDA172	5	Soak-4	Versa Clean	120	nom-2	6.3	0.01786
CDA172	6	Soak-4	Versa Clean	120	nom-2	6.3	0.01775
CDA172	7	Soak-4	PF Degreaser	120	as-rec	100	0.00120
CDA172	8	Soak-4	PF Degreaser	120	as-rec	100	0.00105
CDA172	9	Soak-4	PF Degreaser	120	as-rec	100	0.00134
CDA172	10	Soak-4	EZE 244	120	as-rec	100	0.06067
CDA172	11	Soak-4	EZE 244	120	as-rec	100	0.05469
CDA172	12	Soak-4	EZE 244	120	as-rec	100	0.06160
CDA172	13	Soak-4	Brulin 815	120	high	9.1	0.04589
CDA172	14	Soak-4	Brulin 815	120	high	9.1	0.06497
CDA172	15	Soak-4	Brulin 815	120	high	9.1	0.05509
CDA172	16	Soak-4	Intex 8125	120	high	20	0.02061
CDA172	17	Soak-4	Intex 8125	120	high	20	0.01887
CDA172	18	Soak-4	Intex 8125	120	high	20	0.01899
CDA172	19	Soak-4	Intex 8284	120	high	15	0.03269
CDA172	20	Soak-4	Intex 8284	120	high	15	0.03361
CDA172	21	Soak-4	Intex 8284	120	high	15	0.03277
CDA172	22	Soak-4	Kyzen	120	as-rec	100	0.00723
CDA172	23	Soak-4	Kyzen	120	as-rec	100	0.00699
CDA172	24	Soak-4	Kyzen	120	as-rec	100	0.00722
CDA172	25	Soak-4	DI H2O	120	as-prep	100	0.00106
CDA172	26	Soak-4	DI H2O	120	as-prep	100	0.00089
CDA172	27	Soak-4	DI H2O	120	as-prep	100	0.00102
CDA172	28	Soak-4	CFC 113	115	as-rec	100	0.00057
CDA172	29	Soak-4	CFC 113	115	as-rec	100	0.00066
CDA172	30	Soak-4	CFC 113	115	as-rec	100	0.00067

Beryllium Copper (CDA172), Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA172	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.00118
CDA172	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.00116
CDA172	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.00094
CDA172	34	Sonc-4	PF Degreaser	120	as-rec	100	0.00066
CDA172	35	Sonc-4	PF Degreaser	120	as-rec	100	0.00031
CDA172	36	Sonc-4	PF Degreaser	120	as-rec	100	0.00014
CDA172	37	Sonc-4	EZE 244	120	as-rec	100	0.00220
CDA172	38	Sonc-4	EZE 244	120	as-rec	100	0.00248
CDA172	39	Sonc-4	EZE 244	120	as-rec	100	0.00313
CDA172	40	Sonc-4	Brulin 815	120	high	9.1	0.00174
CDA172	41	Sonc-4	Brulin 815	120	high	9.1	0.00159
CDA172	42	Sonc-4	Brulin 815	120	high	9.1	0.00193
CDA172	43	Sonc-4	Intex 8125	120	high	10	0.00118
CDA172	44	Sonc-4	Intex 8125	120	high	10	0.00084
CDA172	45	Sonc-4	Intex 8125	120	high	10	0.00071
CDA172	46	Sonc-4	Intex 8284	120	high	15	0.00197
CDA172	47	Sonc-4	Intex 8284	120	high	15	0.00189
CDA172	48	Sonc-4	Intex 8284	120	high	15	0.00225
CDA172	49	Sonc-4	Kyzen	120	as-rec	100	-0.00116
CDA172	50	Sonc-4	Kyzen	120	as-rec	100	-0.00111
CDA172	51	Sonc-4	Kyzen	120	as-rec	100	-0.00107
CDA172	52	Sonc-4	DI H2O	120	as-prep	100	0.00000
CDA172	53	Sonc-4	DI H2O	120	as-prep	100	-0.00022
CDA172	54	Sonc-4	DI H2O	120	as-prep	100	-0.00035
CDA172	55	Sonc-4	CFC 113	115	as-rec	100	-0.00040
CDA172	56	Sonc-4	CFC 113	115	as-rec	100	-0.00013
CDA172	57	Sonc-4	CFC 113	115	as-rec	100	-0.00004

Chromium Copper , 16-Hour Soak Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA182	4	Soak-4	Versa Clean	120	nom-2	6.3	0.02002
CDA182	5	Soak-4	Versa Clean	120	nom-2	6.3	0.02111
CDA182	6	Soak-4	Versa Clean	120	nom-2	6.3	0.02044
CDA182	7	Soak-4	PF Degreaser	120	as-rec	100	0.00049
CDA182	8	Soak-4	PF Degreaser	120	as-rec	100	0.00073
CDA182	9	Soak-4	PF Degreaser	120	as-rec	100	0.00049
CDA182	10	Soak-4	EZE 244	120	as-rec	100	0.05509
CDA182	11	Soak-4	EZE 244	120	as-rec	100	0.05176
CDA182	12	Soak-4	EZE 244	120	as-rec	100	0.05638
CDA182	13	Soak-4	Brulin 815	120	high	9.1	0.04210
CDA182	14	Soak-4	Brulin 815	120	high	9.1	0.04282
CDA182	15	Soak-4	Brulin 815	120	high	9.1	0.04295
CDA182	16	Soak-4	Intex 8125	120	high	20	-0.00292
CDA182	17	Soak-4	Intex 8125	120	high	20	0.00073
CDA182	18	Soak-4	Intex 8125	120	high	20	-0.00102
CDA182	19	Soak-4	Intex 8284	120	high	15	0.03644
CDA182	20	Soak-4	Intex 8284	120	high	15	0.03609
CDA182	21	Soak-4	Intex 8284	120	high	15	0.03534
CDA182	22	Soak-4	Kyzen	120	as-rec	100	0.00642
CDA182	23	Soak-4	Kyzen	120	as-rec	100	0.00575
CDA182	24	Soak-4	Kyzen	120	as-rec	100	0.00649
CDA182	25	Soak-4	DI H2O	120	as-prep	100	0.00107
CDA182	26	Soak-4	DI H2O	120	as-prep	100	0.00084
CDA182	27	Soak-4	DI H2O	120	as-prep	100	0.00091
CDA182	28	Soak-4	CFC 113	115	as-rec	100	-0.00019
CDA182	29	Soak-4	CFC 113	115	as-rec	100	-0.00027
CDA182	30	Soak-4	CFC 113	115	as-rec	100	-0.00008

Chromium Copper , Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA182	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.00171
CDA182	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.00141
CDA182	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.00164
CDA182	34	Sonc-4	PF Degreaser	120	as-rec	100	0.00023
CDA182	35	Sonc-4	PF Degreaser	120	as-rec	100	0.00011
CDA182	36	Sonc-4	PF Degreaser	120	as-rec	100	0.00023
CDA182	37	Sonc-4	EZE 244	120	as-rec	100	0.00383
CDA182	38	Sonc-4	EZE 244	120	as-rec	100	0.00409
CDA182	39	Sonc-4	EZE 244	120	as-rec	100	0.00505
CDA182	40	Sonc-4	Brulin 815	120	high	9.1	0.00171
CDA182	41	Sonc-4	Brulin 815	120	high	9.1	0.00262
CDA182	42	Sonc-4	Brulin 815	120	high	9.1	0.00176
CDA182	43	Sonc-4	Intex 8125	120	high	10	0.00261
CDA182	44	Sonc-4	Intex 8125	120	high	10	0.00214
CDA182	45	Sonc-4	Intex 8125	120	high	10	0.00137
CDA182	46	Sonc-4	Intex 8284	120	high	15	0.00295
CDA182	47	Sonc-4	Intex 8284	120	high	15	0.00332
CDA182	48	Sonc-4	Intex 8284	120	high	15	0.00316
CDA182	49	Sonc-4	Kyzen	120	as-rec	100	-0.00225
CDA182	50	Sonc-4	Kyzen	120	as-rec	100	-0.00164
CDA182	51	Sonc-4	Kyzen	120	as-rec	100	-0.00159
CDA182	52	Sonc-4	DI H2O	120	as-prep	100	0.00068
CDA182	53	Sonc-4	DI H2O	120	as-prep	100	0.00081
CDA182	54	Sonc-4	DI H2O	120	as-prep	100	0.00053
CDA182	55	Sonc-4	CFC 113	115	as-rec	100	0.00030
CDA182	56	Sonc-4	CFC 113	115	as-rec	100	-0.00008
CDA182	57	Sonc-4	CFC 113	115	as-rec	100	-0.00011

Chromium Steel (52100), 16-Hour Soak Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
52100	4	Soak-4	Versa Clean	120	nom-2	6.3	0.00275
52100	5	Soak-4	Versa Clean	120	nom-2	6.3	0.00257
52100	6	Soak-4	Versa Clean	120	nom-2	6.3	0.00287
52100	7	Soak-4	PF Degreaser	120	as-rec	100	0.00184
52100	8	Soak-4	PF Degreaser	120	as-rec	100	0.00149
52100	9	Soak-4	PF Degreaser	120	as-rec	100	0.00140
52100	10	Soak-4	EZE 244	120	as-rec	100	0.00202
52100	11	Soak-4	EZE 244	120	as-rec	100	0.00145
52100	12	Soak-4	EZE 244	120	as-rec	100	0.00164
52100	13	Soak-4	Brulin 815	120	high	9.1	0.00167
52100	14	Soak-4	Brulin 815	120	high	9.1	0.00181
52100	15	Soak-4	Brulin 815	120	high	9.1	0.00138
52100	16	Soak-4	Intex 8125	120	high	20	0.10609
52100	17	Soak-4	Intex 8125	120	high	20	0.11983
52100	18	Soak-4	Intex 8125	120	high	20	0.11866
52100	19	Soak-4	Intex 8284	120	high	15	0.99176
52100	20	Soak-4	Intex 8284	120	high	15	1.04438
52100	21	Soak-4	Intex 8284	120	high	15	1.05017
52100	22	Soak-4	Kyzen	120	as-rec	100	0.00081
52100	23	Soak-4	Kyzen	120	as-rec	100	0.00078
52100	24	Soak-4	Kyzen	120	as-rec	100	0.00051
52100	25	Soak-4	DI H2O	120	as-prep	100	0.04779
52100	26	Soak-4	DI H2O	120	as-prep	100	0.04999
52100	27	Soak-4	DI H2O	120	as-prep	100	0.04254
52100	28	Soak-4	CFC 113	115	as-rec	100	0.00004
52100	29	Soak-4	CFC 113	115	as-rec	100	0.00019
52100	30	Soak-4	CFC 113	115	as-rec	100	0.00009

Chromium Steel (52100), Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
52100	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.00104
52100	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.00039
52100	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.00026
52100	34	Sonc-4	PF Degreaser	120	as-rec	100	-0.00021
52100	35	Sonc-4	PF Degreaser	120	as-rec	100	-0.00021
52100	36	Sonc-4	PF Degreaser	120	as-rec	100	-0.00031
52100	37	Sonc-4	EZE 244	120	as-rec	100	-0.00004
52100	38	Sonc-4	EZE 244	120	as-rec	100	-0.00004
52100	39	Sonc-4	EZE 244	120	as-rec	100	-0.00017
52100	40	Sonc-4	Brulin 815	120	high	9.1	0.00043
52100	41	Sonc-4	Brulin 815	120	high	9.1	0.00060
52100	42	Sonc-4	Brulin 815	120	high	9.1	0.00017
52100	43	Sonc-4	Intex 8125	120	high	10	0.00137
52100	44	Sonc-4	Intex 8125	120	high	10	0.00077
52100	45	Sonc-4	Intex 8125	120	high	10	0.00095
52100	46	Sonc-4	Intex 8284	120	high	15	0.00979
52100	47	Sonc-4	Intex 8284	120	high	15	0.00853
52100	48	Sonc-4	Intex 8284	120	high	15	0.01000
52100	49	Sonc-4	Kyzen	120	as-rec	100	0.00009
52100	50	Sonc-4	Kyzen	120	as-rec	100	-0.00021
52100	51	Sonc-4	Kyzen	120	as-rec	100	-0.00017
52100	52	Sonc-4	DI H2O	120	as-prep	100	-0.00051
52100	53	Sonc-4	DI H2O	120	as-prep	100	-0.00026
52100	54	Sonc-4	DI H2O	120	as-prep	100	-0.00013
52100	55	Sonc-4	CFC 113	115	as-rec	100	-0.00017
52100	56	Sonc-4	CFC 113	115	as-rec	100	-0.00045
52100	57	Sonc-4	CFC 113	115	as-rec	100	-0.00030

Gold-Plated Brass, 16-Hour Soaking Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA260-GP	104	Soak-4	Versa Clean	120	nom-2	6.3	-0.00039
CDA260-GP	105	Soak-4	Versa Clean	120	nom-2	6.3	-0.00060
CDA260-GP	106	Soak-4	Versa Clean	120	nom-2	6.3	-0.00029
CDA260-GP	107	Soak-4	PF Degreaser	120	as-rec	100	-0.00026
CDA260-GP	108	Soak-4	PF Degreaser	120	as-rec	100	-0.00039
CDA260-GP	109	Soak-4	PF Degreaser	120	as-rec	100	-0.00030
CDA260-GP	110	Soak-4	EZE 244	120	as-rec	100	0.00017
CDA260-GP	111	Soak-4	EZE 244	120	as-rec	100	-0.00056
CDA260-GP	112	Soak-4	EZE 244	120	as-rec	100	-0.00009
CDA260-GP	113	Soak-4	Brulin 815	120	high	9.1	-0.00013
CDA260-GP	114	Soak-4	Brulin 815	120	high	9.1	-0.00026
CDA260-GP	115	Soak-4	Brulin 815	120	high	9.1	-0.00026
CDA260-GP	116	Soak-4	Intex 8125	120	high	20	-0.00013
CDA260-GP	117	Soak-4	Intex 8125	120	high	20	-0.00048
CDA260-GP	118	Soak-4	Intex 8125	120	high	20	-0.00038
CDA260-GP	119	Soak-4	Intex 8284	120	high	15	0.00206
CDA260-GP	120	Soak-4	Intex 8284	120	high	15	0.00180
CDA260-GP	121	Soak-4	Intex 8284	120	high	15	0.00133
CDA260-GP	122	Soak-4	Kyzen	120	as-rec	100	-0.00038
CDA260-GP	123	Soak-4	Kyzen	120	as-rec	100	-0.00017
CDA260-GP	124	Soak-4	Kyzen	120	as-rec	100	-0.00017
CDA260-GP	125	Soak-4	DI H2O	120	as-prep	100	-0.00013
CDA260-GP	126	Soak-4	DI H2O	120	as-prep	100	0.00013
CDA260-GP	127	Soak-4	DI H2O	120	as-prep	100	0.00017
CDA260-GP	128	Soak-4	CFC 113	115	as-rec	100	-0.00030
CDA260-GP	129	Soak-4	CFC 113	115	as-rec	100	-0.00026
CDA260-GP	130	Soak-4	CFC 113	115	as-rec	100	-0.00004

Gold-Plated Brass, Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA260-GP	131	Sonc-4	Versa Clean	120	nom-2	6.3	0.00034
CDA260-GP	132	Sonc-4	Versa Clean	120	nom-2	6.3	-0.00013
CDA260-GP	133	Sonc-4	Versa Clean	120	nom-2	6.3	-0.00021
CDA260-GP	134	Sonc-4	PF Degreaser	120	as-rec	100	-0.00112
CDA260-GP	135	Sonc-4	PF Degreaser	120	as-rec	100	-0.00030
CDA260-GP	136	Sonc-4	PF Degreaser	120	as-rec	100	-0.00017
CDA260-GP	137	Sonc-4	EZE 244	120	as-rec	100	-0.00056
CDA260-GP	138	Sonc-4	EZE 244	120	as-rec	100	-0.00039
CDA260-GP	139	Sonc-4	EZE 244	120	as-rec	100	-0.00051
CDA260-GP	140	Sonc-4	Brulin 815	120	high	9.1	0.00013
CDA260-GP	141	Sonc-4	Brulin 815	120	high	9.1	0.00017
CDA260-GP	142	Sonc-4	Brulin 815	120	high	9.1	0.00030
CDA260-GP	143	Sonc-4	Intex 8125	120	high	10	0.00000
CDA260-GP	144	Sonc-4	Intex 8125	120	high	10	-0.00013
CDA260-GP	145	Sonc-4	Intex 8125	120	high	10	-0.00004
CDA260-GP	146	Sonc-4	Intex 8284	120	high	15	0.00013
CDA260-GP	147	Sonc-4	Intex 8284	120	high	15	0.00061
CDA260-GP	148	Sonc-4	Intex 8284	120	high	15	0.00043
CDA260-GP	149	Sonc-4	Kyzen	120	as-rec	100	-0.00026
CDA260-GP	150	Sonc-4	Kyzen	120	as-rec	100	-0.00013
CDA260-GP	151	Sonc-4	Kyzen	120	as-rec	100	-0.00030
CDA260-GP	152	Sonc-4	DI H2O	120	as-prep	100	-0.00030
CDA260-GP	153	Sonc-4	DI H2O	120	as-prep	100	-0.00017
CDA260-GP	154	Sonc-4	DI H2O	120	as-prep	100	-0.00021
CDA260-GP	155	Sonc-4	CFC 113	115	as-rec	100	-0.00017
CDA260-GP	156	Sonc-4	CFC 113	115	as-rec	100	-0.00035
CDA260-GP	157	Sonc-4	CFC 113	115	as-rec	100	-0.00043

HyMu77, 16-Hour Soak Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
HyMu77	4	Soak-4	Versa Clean	120	nom-2	6.3	0.00498
HyMu77	5	Soak-4	Versa Clean	120	nom-2	6.3	0.00485
HyMu77	6	Soak-4	Versa Clean	120	nom-2	6.3	0.00522
HyMu77	7	Soak-4	PF Degreaser	120	as-rec	100	0.00376
HyMu77	8	Soak-4	PF Degreaser	120	as-rec	100	0.00349
HyMu77	9	Soak-4	PF Degreaser	120	as-rec	100	0.00363
HyMu77	10	Soak-4	EZE 244	120	as-rec	100	0.00398
HyMu77	11	Soak-4	EZE 244	120	as-rec	100	0.00593
HyMu77	12	Soak-4	EZE 244	120	as-rec	100	0.00479
HyMu77	13	Soak-4	Brulin 815	120	high	9.1	0.00346
HyMu77	14	Soak-4	Brulin 815	120	high	9.1	0.00440
HyMu77	15	Soak-4	Brulin 815	120	high	9.1	0.00360
HyMu77	16	Soak-4	Intex 8125	120	high	20	0.00395
HyMu77	17	Soak-4	Intex 8125	120	high	20	0.00439
HyMu77	18	Soak-4	Intex 8125	120	high	20	0.00452
HyMu77	19	Soak-4	Intex 8284	120	high	15	0.19319
HyMu77	20	Soak-4	Intex 8284	120	high	15	0.20781
HyMu77	21	Soak-4	Intex 8284	120	high	15	0.16192
HyMu77	22	Soak-4	Kyzen	120	as-rec	100	0.00394
HyMu77	23	Soak-4	Kyzen	120	as-rec	100	0.00291
HyMu77	24	Soak-4	Kyzen	120	as-rec	100	0.00378
HyMu77	25	Soak-4	DI H2O	120	as-prep	100	0.00263
HyMu77	26	Soak-4	DI H2O	120	as-prep	100	0.00271
HyMu77	27	Soak-4	DI H2O	120	as-prep	100	0.00292
HyMu77	28	Soak-4	CFC 113	115	as-rec	100	0.00168
HyMu77	29	Soak-4	CFC 113	115	as-rec	100	0.00165
HyMu77	30	Soak-4	CFC 113	115	as-rec	100	0.00167

HyMu77, Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
HyMu77	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.00371
HyMu77	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.00416
HyMu77	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.00289
HyMu77	34	Sonc-4	PF Degreaser	120	as-rec	100	0.00200
HyMu77	35	Sonc-4	PF Degreaser	120	as-rec	100	0.00197
HyMu77	36	Sonc-4	PF Degreaser	120	as-rec	100	0.00262
HyMu77	37	Sonc-4	EZE 244	120	as-rec	100	0.00348
HyMu77	38	Sonc-4	EZE 244	120	as-rec	100	0.00360
HyMu77	39	Sonc-4	EZE 244	120	as-rec	100	0.00331
HyMu77	40	Sonc-4	Brulin 815	120	high	9.1	0.00511
HyMu77	41	Sonc-4	Brulin 815	120	high	9.1	0.00544
HyMu77	42	Sonc-4	Brulin 815	120	high	9.1	0.00483
HyMu77	43	Sonc-4	Intex 8125	120	high	10	0.00317
HyMu77	44	Sonc-4	Intex 8125	120	high	10	0.00408
HyMu77	45	Sonc-4	Intex 8125	120	high	10	0.00303
HyMu77	46	Sonc-4	Intex 8284	120	high	15	0.00686
HyMu77	47	Sonc-4	Intex 8284	120	high	15	0.00603
HyMu77	48	Sonc-4	Intex 8284	120	high	15	0.00603
HyMu77	49	Sonc-4	Kyzen	120	as-rec	100	0.00256
HyMu77	50	Sonc-4	Kyzen	120	as-rec	100	0.00320
HyMu77	51	Sonc-4	Kyzen	120	as-rec	100	0.00364
HyMu77	52	Sonc-4	DI H2O	120	as-prep	100	0.00195
HyMu77	53	Sonc-4	DI H2O	120	as-prep	100	0.00182
HyMu77	54	Sonc-4	DI H2O	120	as-prep	100	0.00152
HyMu77	55	Sonc-4	CFC 113	115	as-rec	100	0.00075
HyMu77	56	Sonc-4	CFC 113	115	as-rec	100	0.00106
HyMu77	57	Sonc-4	CFC 113	115	as-rec	100	0.00135

Inconel 600, Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
I600	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.00115
I600	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.00122
I600	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.00128
I600	34	Sonc-4	PF Degreaser	120	as-rec	100	0.00058
I600	35	Sonc-4	PF Degreaser	120	as-rec	100	0.00048
I600	36	Sonc-4	PF Degreaser	120	as-rec	100	0.00068
I600	37	Sonc-4	EZE 244	120	as-rec	100	0.00115
I600	38	Sonc-4	EZE 244	120	as-rec	100	0.00111
I600	39	Sonc-4	EZE 244	120	as-rec	100	0.00088
I600	40	Sonc-4	Brulin 815	120	high	9.1	0.00204
I600	41	Sonc-4	Brulin 815	120	high	9.1	0.00196
I600	42	Sonc-4	Brulin 815	120	high	9.1	0.00173
I600	43	Sonc-4	Intex 8125	120	high	10	0.00153
I600	44	Sonc-4	Intex 8125	120	high	10	0.00143
I600	45	Sonc-4	Intex 8125	120	high	10	0.00145
I600	46	Sonc-4	Intex 8284	120	high	15	0.00184
I600	47	Sonc-4	Intex 8284	120	high	15	0.00208
I600	48	Sonc-4	Intex 8284	120	high	15	0.00145
I600	49	Sonc-4	Kyzen	120	as-rec	100	0.00109
I600	50	Sonc-4	Kyzen	120	as-rec	100	0.00088
I600	51	Sonc-4	Kyzen	120	as-rec	100	0.00062
I600	52	Sonc-4	DI H2O	120	as-prep	100	0.00094
I600	53	Sonc-4	DI H2O	120	as-prep	100	0.00067
I600	54	Sonc-4	DI H2O	120	as-prep	100	0.00081
I600	55	Sonc-4	CFC 113	115	as-rec	100	0.00062
I600	56	Sonc-4	CFC 113	115	as-rec	100	0.00050
I600	57	Sonc-4	CFC 113	115	as-rec	100	0.00044

Solder (60Sn-40Pb), One-Hour Soak Test Data
(Experiment No. 5)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
60-40	3	Soak-5	Versa Clean	120	nom-2	6.3	0.05097
60-40	4	Soak-5	Versa Clean	120	nom-2	6.3	0.05784
60-40	5	Soak-5	PF Degreaser	120	as-rec	100	0.00246
60-40	6	Soak-5	PF Degreaser	120	as-rec	100	0.00198
60-40	7	Soak-5	EZE 244	120	as-rec	100	0.02322
60-40	8	Soak-5	EZE 244	120	as-rec	100	0.01579
60-40	9	Soak-5	Brulin 815	120	high	9.1	0.01482
60-40	10	Soak-5	Brulin 815	120	high	9.1	0.01510
60-40	11	Soak-5	Intex 8125	120	high	20	0.08009
60-40	12	Soak-5	Intex 8125	120	high	20	0.07051
60-40	13	Soak-5	Intex 8284	120	high	15	0.05928
60-40	14	Soak-5	Intex 8284	120	high	15	0.05367
60-40	15	Soak-5	Kyzen	120	as-rec	100	0.00132
60-40	16	Soak-5	Kyzen	120	as-rec	100	0.00113
60-40	17	Soak-5	DI H2O	120	as-prep	100	0.00130
60-40	18	Soak-5	DI H2O	120	as-prep	100	0.00199
60-40	19	Soak-5	CFC 113	115	as-rec	100	0.00113
60-40	20	Soak-5	CFC 113	115	as-rec	100	0.00130

Type 304 Stainless Steel, 16-Hour Soak Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
304	4	Soak-4	Versa Clean	120	nom-2	6.3	0.00163
304	5	Soak-4	Versa Clean	120	nom-2	6.3	0.00182
304	6	Soak-4	Versa Clean	120	nom-2	6.3	0.00162
304	7	Soak-4	PF Degreaser	120	as-rec	100	0.00126
304	8	Soak-4	PF Degreaser	120	as-rec	100	0.00108
304	9	Soak-4	PF Degreaser	120	as-rec	100	0.00123
304	10	Soak-4	EZE 244	120	as-rec	100	0.00105
304	11	Soak-4	EZE 244	120	as-rec	100	0.00143
304	12	Soak-4	EZE 244	120	as-rec	100	0.00152
304	13	Soak-4	Brulin 815	120	high	9.1	0.00146
304	14	Soak-4	Brulin 815	120	high	9.1	0.00134
304	15	Soak-4	Brulin 815	120	high	9.1	0.00142
304	16	Soak-4	Intex 8125	120	high	20	0.00173
304	17	Soak-4	Intex 8125	120	high	20	0.00191
304	18	Soak-4	Intex 8125	120	high	20	0.00153
304	19	Soak-4	Intex 8284	120	high	15	0.00179
304	20	Soak-4	Intex 8284	120	high	15	0.00172
304	21	Soak-4	Intex 8284	120	high	15	0.00160
304	22	Soak-4	Kyzen	120	as-rec	100	0.00174
304	23	Soak-4	Kyzen	120	as-rec	100	0.00114
304	24	Soak-4	Kyzen	120	as-rec	100	0.00146
304	25	Soak-4	DI H2O	120	as-prep	100	0.00067
304	26	Soak-4	DI H2O	120	as-prep	100	0.00093
304	27	Soak-4	DI H2O	120	as-prep	100	0.00023
304	28	Soak-4	CFC 113	115	as-rec	100	0.00047
304	29	Soak-4	CFC 113	115	as-rec	100	0.00047
304	30	Soak-4	CFC 113	115	as-rec	100	0.00062

Type 304 Stainless Steel, Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
304	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.00173
304	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.00142
304	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.00171
304	34	Sonc-4	PF Degreaser	120	as-rec	100	0.00075
304	35	Sonc-4	PF Degreaser	120	as-rec	100	0.00070
304	36	Sonc-4	PF Degreaser	120	as-rec	100	0.00082
304	37	Sonc-4	EZE 244	120	as-rec	100	0.00165
304	38	Sonc-4	EZE 244	120	as-rec	100	0.00125
304	39	Sonc-4	EZE 244	120	as-rec	100	0.00150
304	40	Sonc-4	Brulin 815	120	high	9.1	0.00173
304	41	Sonc-4	Brulin 815	120	high	9.1	0.00168
304	42	Sonc-4	Brulin 815	120	high	9.1	0.00166
304	43	Sonc-4	Intex 8125	120	high	10	0.00127
304	44	Sonc-4	Intex 8125	120	high	10	0.00143
304	45	Sonc-4	Intex 8125	120	high	10	0.00193
304	46	Sonc-4	Intex 8284	120	high	15	0.00228
304	47	Sonc-4	Intex 8284	120	high	15	0.00210
304	48	Sonc-4	Intex 8284	120	high	15	0.00233
304	49	Sonc-4	Kyzen	120	as-rec	100	0.00139
304	50	Sonc-4	Kyzen	120	as-rec	100	0.00159
304	51	Sonc-4	Kyzen	120	as-rec	100	0.00153
304	52	Sonc-4	DI H2O	120	as-prep	100	0.00142
304	53	Sonc-4	DI H2O	120	as-prep	100	0.00162
304	54	Sonc-4	DI H2O	120	as-prep	100	0.00152
304	55	Sonc-4	CFC 113	115	as-rec	100	0.00125
304	56	Sonc-4	CFC 113	115	as-rec	100	0.00115
304	57	Sonc-4	CFC 113	115	as-rec	100	0.00117

Type 316 Stainless Steel, Sonication Test Data
(Experiment No. 4)

Coupon ID Alloy	No.	Test	Cleaner Name	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
316	31	Sonc-4	Versa Clean	120	nom-2	6.3	0.00162
316	32	Sonc-4	Versa Clean	120	nom-2	6.3	0.00167
316	33	Sonc-4	Versa Clean	120	nom-2	6.3	0.00179
316	34	Sonc-4	PF Degreaser	120	as-rec	100	0.00057
316	35	Sonc-4	PF Degreaser	120	as-rec	100	0.00089
316	36	Sonc-4	PF Degreaser	120	as-rec	100	0.00064
316	37	Sonc-4	EZE 244	120	as-rec	100	0.00156
316	38	Sonc-4	EZE 244	120	as-rec	100	0.00143
316	39	Sonc-4	EZE 244	120	as-rec	100	0.00138
316	40	Sonc-4	Brulin 815	120	high	9.1	0.00234
316	41	Sonc-4	Brulin 815	120	high	9.1	0.00198
316	42	Sonc-4	Brulin 815	120	high	9.1	0.00163
316	43	Sonc-4	Intex 8125	120	high	10	0.00156
316	44	Sonc-4	Intex 8125	120	high	10	0.00106
316	45	Sonc-4	Intex 8125	120	high	10	0.00129
316	46	Sonc-4	Intex 8284	120	high	15	0.00166
316	47	Sonc-4	Intex 8284	120	high	15	0.00235
316	48	Sonc-4	Intex 8284	120	high	15	0.00194
316	49	Sonc-4	Kyzen	120	as-rec	100	0.00092
316	50	Sonc-4	Kyzen	120	as-rec	100	0.00102
316	51	Sonc-4	Kyzen	120	as-rec	100	0.00065
316	52	Sonc-4	DI H2O	120	as-prep	100	0.00046
316	53	Sonc-4	DI H2O	120	as-prep	100	0.00092
316	54	Sonc-4	DI H2O	120	as-prep	100	0.00055
316	55	Sonc-4	CFC 113	115	as-rec	100	0.00065
316	56	Sonc-4	CFC 113	115	as-rec	100	0.00028
316	57	Sonc-4	CFC 113	115	as-rec	100	0.00051

All One-Hour Soak Data (Except Solder)
(Experiment No. 5)

Coupon ID Alloy	No.	Test	Cleaner	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
4750	100	Soak-5	Intex 8125	120	high	20	0.00666
4750	101	Soak-5	Intex 8125	120	high	20	0.00671
4750	102	Soak-5	Intex 8125	120	high	20	0.00625
4750	103	Soak-5	Intex 8284	120	high	15	0.00854
4750	104	Soak-5	Intex 8284	120	high	15	0.00791
4750	105	Soak-5	Intex 8284	120	high	15	0.00785
52100	58	Soak-5	Intex 8125	120	high	20	0.01940
52100	59	Soak-5	Intex 8125	120	high	20	0.01840
52100	60	Soak-5	Intex 8125	120	high	20	0.01954
AA2017	269	Soak-5	Intex 8125	120	high	20	0.00802
AA2017	270	Soak-5	Intex 8125	120	high	20	0.00706
AA2017	271	Soak-5	Intex 8125	120	high	20	0.00645
AA2017	272	Soak-5	Intex 8284	120	high	15	0.00479
AA2017	273	Soak-5	Intex 8284	120	high	15	0.00458
AA2017	274	Soak-5	Intex 8284	120	high	15	0.00468
AA2017	275	Soak-5	DI H20	120	as-prep	100	0.00245
AA2017	276	Soak-5	DI H20	120	as-prep	100	0.00289
AA2017	277	Soak-5	DI H20	120	as-prep	100	0.00245
Beryllium	33A	Soak-5	Intex 8284	120	high	20	0.00093
Beryllium	33B	Soak-5	Intex 8284	120	high	20	0.00136
CDA172	7	Soak-5	Versa Clean	120	nom-2	6.3	0.00076
CDA172	8	Soak-5	Versa Clean	120	nom-2	6.3	0.00057
CDA172	9	Soak-5	Versa Clean	120	nom-2	6.3	0.00085
CDA172	25	Soak-5	EZE244	120	as-rec	100	0.00973
CDA172	26	Soak-5	EZE244	120	as-rec	100	0.00932
CDA172	27	Soak-5	EZE244	120	as-rec	100	0.01046
CDA172	28	Soak-5	Brulin	120	high	9.1	0.00466
CDA172	29	Soak-5	Brulin	120	high	9.1	0.00415
CDA172	30	Soak-5	Brulin	120	high	9.1	0.00395
CDA172	52	Soak-5	Intex 8125	120	high	20	0.00151
CDA172	53	Soak-5	Intex 8125	120	high	20	0.00166
CDA172	54	Soak-5	Intex 8125	120	high	20	0.00203
CDA172	55	Soak-5	Intex 8284	120	high	15	0.00372
CDA172	56	Soak-5	Intex 8284	120	high	15	0.00365
CDA172	57	Soak-5	Intex 8284	120	high	15	0.00343
CDA172	58	Soak-5	Kyzen	120	as-rec	100	0.00027
CDA172	59	Soak-5	Kyzen	120	as-rec	100	0.00087
CDA172	60	Soak-5	Kyzen	120	as-rec	100	0.00044
CDA182	7	Soak-5	EZE244	120	as-rec	100	0.01431
CDA182	8	Soak-5	EZE244	120	as-rec	100	0.01730
CDA182	9	Soak-5	EZE244	120	as-rec	100	0.01549
CDA182	28	Soak-5	Kyzen	120	as-rec	100	-0.00198
CDA182	29	Soak-5	Kyzen	120	as-rec	100	-0.00175
CDA182	30	Soak-5	Kyzen	120	as-rec	100	-0.00057
CDA182	58	Soak-5	Intex 8284	120	high	15	0.00395
CDA182	59	Soak-5	Intex 8284	120	high	15	0.00447
CDA182	60	Soak-5	Intex 8284	120	high	15	0.00423

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All One-Hour Soak Data (Except Solder)

(Experiment No. 5) *(Continued)*

Coupon ID Alloy	No.	Test	Cleaner	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
CDA260	1	Soak-5	Intex 8284	120	high	15	0.00543
CDA260	2	Soak-5	Intex 8284	120	high	15	0.00540
CDA260	3	Soak-5	Intex 8284	120	high	15	0.00582
CDA260	55	Soak-5	Kyzen	120	as-rec	100	-0.00578
CDA260	56	Soak-5	Kyzen	120	as-rec	100	-0.00495
CDA260	57	Soak-5	Kyzen	120	as-rec	100	-0.00595
CDA260	76	Soak-5	Intex 8125	120	high	20	0.00126
CDA260	77	Soak-5	Intex 8125	120	high	20	0.00082
CDA260	78	Soak-5	Intex 8125	120	high	20	0.00104
CDA260	161	Soak-5	Versa Clean	120	nom-2	6	0.00289
CDA260	162	Soak-5	Versa Clean	120	nom-2	6	0.00318
CDA260	163	Soak-5	Versa Clean	120	nom-2	6	0.00281
CDA260	164	Soak-5	EZE244	120	as-rec	100	0.01439
CDA260	165	Soak-5	EZE244	120	as-rec	100	0.01402
CDA260	166	Soak-5	EZE244	120	as-rec	100	0.01314
CDA260	167	Soak-5	Brulin	120	high	9.1	0.00681
CDA260	168	Soak-5	Brulin	120	high	9.1	0.00678
CDA260	169	Soak-5	Brulin	120	high	9.1	0.00671
HYMU77	58	Soak-5	Intex 8125	120	high	20	0.00210
HYMU77	59	Soak-5	Intex 8125	120	high	20	0.00361
HYMU77	60	Soak-5	Intex 8125	120	high	20	0.00317
AA2017	296	Soak-5	Versa Clean	120	nom-2	6.3	0.03857
AA2017	297	Soak-5	Versa Clean	120	nom-2	6.3	0.03647
AA2017	298	Soak-5	Versa Clean	120	nom-2	6.3	0.03530
Anod 2017	279	Soak-5	EZE 244	120	as-rec	100	0.25116
Anod 2017	280	Soak-5	EZE 244	120	as-rec	100	0.21738
Anod 2017	281	Soak-5	EZE 244	120	as-rec	100	0.21839
Anod 2017	282	Soak-5	Brulin 815	120	high	9.1	-0.04818
Anod 2017	283	Soak-5	Brulin 815	120	high	9.1	-0.05052
Anod 2017	284	Soak-5	Brulin 815	120	high	9.1	-0.04650
Anod 2017	285	Soak-5	Intex 8284	120	high	15	0.23632
Anod 2017	286	Soak-5	Intex 8284	120	high	15	0.24508
Anod 2017	287	Soak-5	Intex 8284	120	high	15	0.23154
AA6061	58	Soak-5	Versa Clean	120	nom-2	6.3	0.06851
AA6061	59	Soak-5	Versa Clean	120	nom-2	6.3	0.06946
AA6061	60	Soak-5	Versa Clean	120	nom-2	6.3	0.06791
AA6061	61	Soak-5	EZE 244	120	as-rec	100	0.31006
AA6061	62	Soak-5	EZE 244	120	as-rec	100	0.31286
AA6061	63	Soak-5	EZE 244	120	as-rec	100	0.31537
AA6061	64	Soak-5	Intex 8125	120	high	20	0.00260
AA6061	65	Soak-5	Intex 8125	120	high	20	0.00243
AA6061	66	Soak-5	Intex 8125	120	high	20	0.00229
AA6061	67	Soak-5	Intex 8284	120	high	15	0.00431
AA6061	68	Soak-5	Intex 8284	120	high	15	0.00393
AA6061	69	Soak-5	Intex 8284	120	high	15	0.00470

All 10-Minute Soak Test Data
(Experiment No. 6)

Coupon ID Alloy	No.	Cleaner	Temp. (F)	Conc. Type	Conc. (vol. %)	Weight Change (%)
4750	106	Intex 8125	120	high	20	0.00388
4750	107	Intex 8125	120	high	20	0.00305
4750	108	Intex 8125	120	high	20	0.00351
52100	61	Intex 8125	120	high	20	0.00141
52100	62	Intex 8125	120	high	20	0.00116
52100	63	Intex 8125	120	high	20	0.00261
Al2017	300	Versa Clean	120	nom-2	6.3	0.00991
Al2017	301	Versa Clean	120	nom-2	6.3	0.01090
Al2017	302	Versa Clean	120	nom-2	6.3	0.01162
Anod. Al2017	288	EZE244	120	as-rec	100	0.05390
Anod. Al2017	289	EZE244	120	as-rec	100	0.07957
Anod. Al2017	290	EZE244	120	as-rec	100	0.06396
Anod. Al2017	291	Brulin 815	120	high	9.1	0.01294
Anod. Al2017	292	Brulin 815	120	high	9.1	0.01174
Anod. Al2017	293	Brulin 815	120	high	9.1	0.01374
Anod. Al2017	294	Intex 8284	120	high	15	0.08347
Anod. Al2017	295	Intex 8284	120	high	15	0.08176
Al6061	70	Versa Clean	120	nom-2	6.3	0.01675
Al6061	71	Versa Clean	120	nom-2	6.3	0.01878
Al6061	72	Versa Clean	120	nom-2	6.3	0.01631
Al6061	73	EZE244	120	as-rec	100	0.06182
Al6061	74	EZE244	120	as-rec	100	0.06158
Al6061	75	EZE244	120	as-rec	100	0.06045
Al6061	76	Intex 8125	120	high	20	0.00095
Al6061	77	Intex 8125	120	high	20	0.00121
Al6061	78	Intex 8125	120	high	20	0.00108
Al6061	79	Intex 8284	120	high	15	0.00162
Al6061	80	Intex 8284	120	high	15	0.00189
Al6061	81	Intex 8284	120	high	15	0.00177
CDA172	61	Brulin 815	120	high	9.1	0.00151
CDA172	62	Brulin 815	120	high	9.1	0.00199
CDA172	63	Brulin 815	120	as-rec	9.1	0.00172
CDA182	61	EZE244	120	as-rec	100	0.00400
CDA182	62	EZE244	120	as-rec	100	0.00437
CDA182	63	EZE244	120	as-rec	100	0.00433
CDA260	171	EZE244	120	as-rec	100	0.00328
CDA260	172	EZE244	120	as-rec	100	0.00338
CDA260	173	EZE244	120	as-rec	100	0.00348
CDA260	174	Brulin	120	high	9.1	0.00101
CDA260	175	Brulin	120	high	9.1	0.00123
CDA260	176	Brulin	120	high	9.1	0.00121
CDA260	177	Kyzen	120	as-rec	100	-0.00142
CDA260	178	Kyzen	120	as-rec	100	-0.00135
CDA260	179	Kyzen	120	as-rec	100	-0.00151

Appendix I

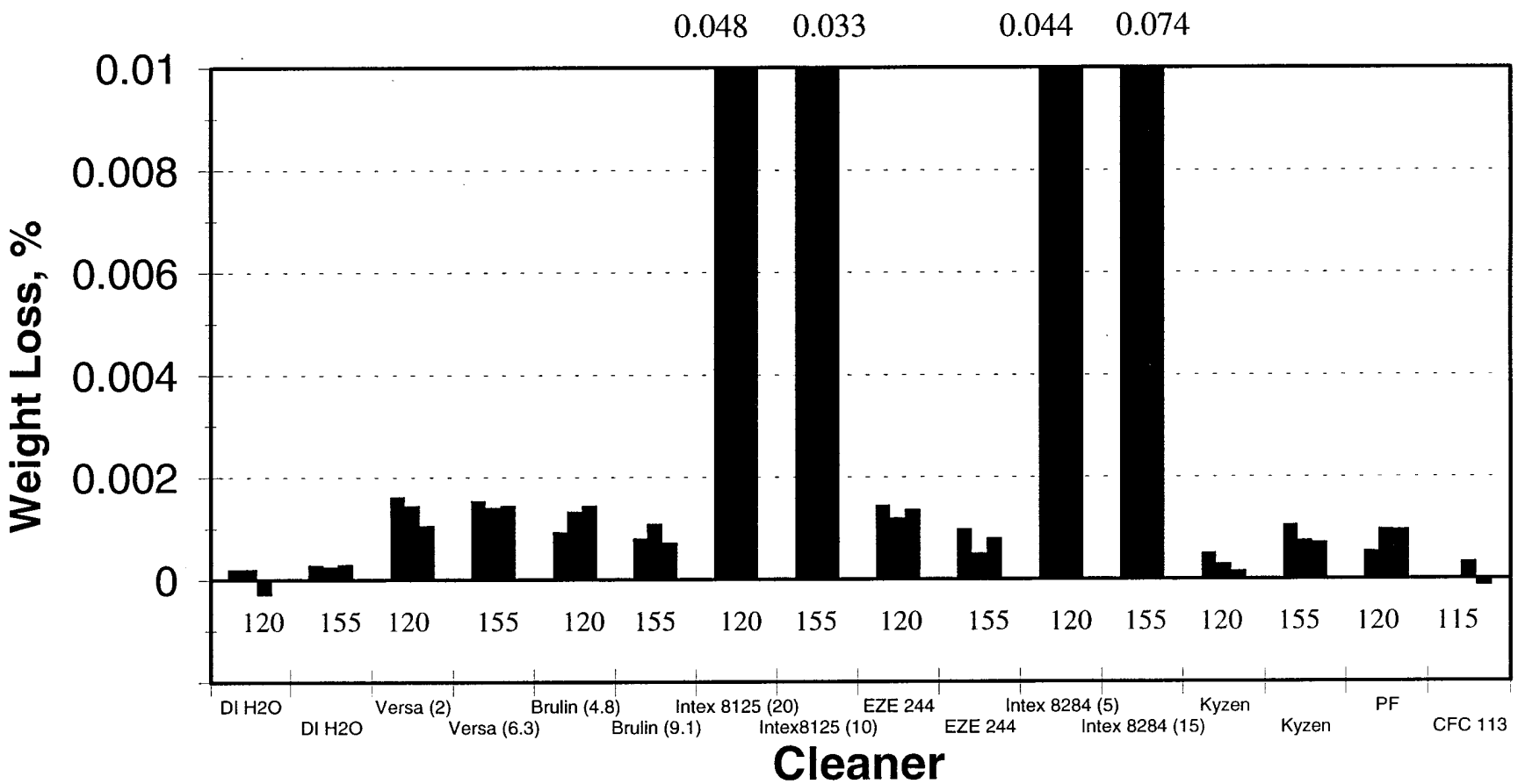
Bar Charts of Weight Loss Data

The graphical representations of the weight loss data are in the form of bar charts. The bar charts are listed alphabetically according to their alloy name (see Table 2). The soaking data and sonication data are graphed separately. However, where practical, all the soaking data for each alloy was displayed on the same graph. The one-hour and ten-minute soaking data graphs are shown at the end of the appendix. The weight loss values of the triplicate coupons (or duplicate coupons in the case of beryllium and solder) are grouped or clustered together. All the bar charts have the same maximum value of 0.01 percent on the y-axis to facilitate comparisons between the different alloys. Positive y-axis values correspond to weight loss, and negative values correspond to weight gain.

Average bar chart values of the triplicate coupons were placed above the bars in the cases where the values exceeded the y-axis scale. The nine cleaners are listed on the x-axis in the same order from left to right as they are listed in Table 1 from top to bottom. The first seven cleaners are aqueous base and the last two are non-aqueous. Concentrations are shown in parentheses next to the cleaner name in charts having both low and high concentration values. Similarly, temperatures (in degrees F) are shown near bars for charts displaying data at two temperatures.

Wt. Loss for 4750 Steel

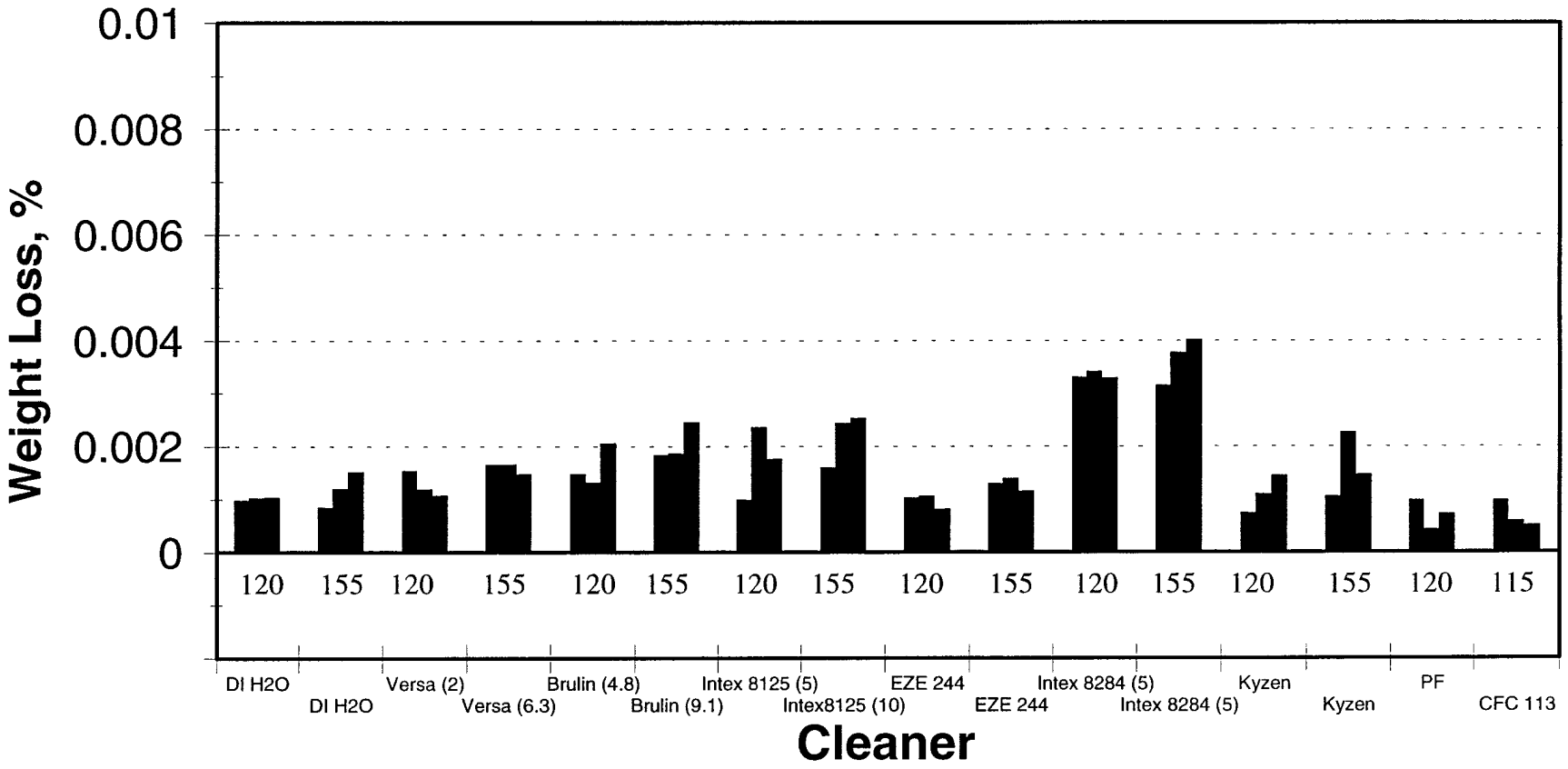
16-hour Soak



4750_soak_3

Wt. Loss for 4750 Steel

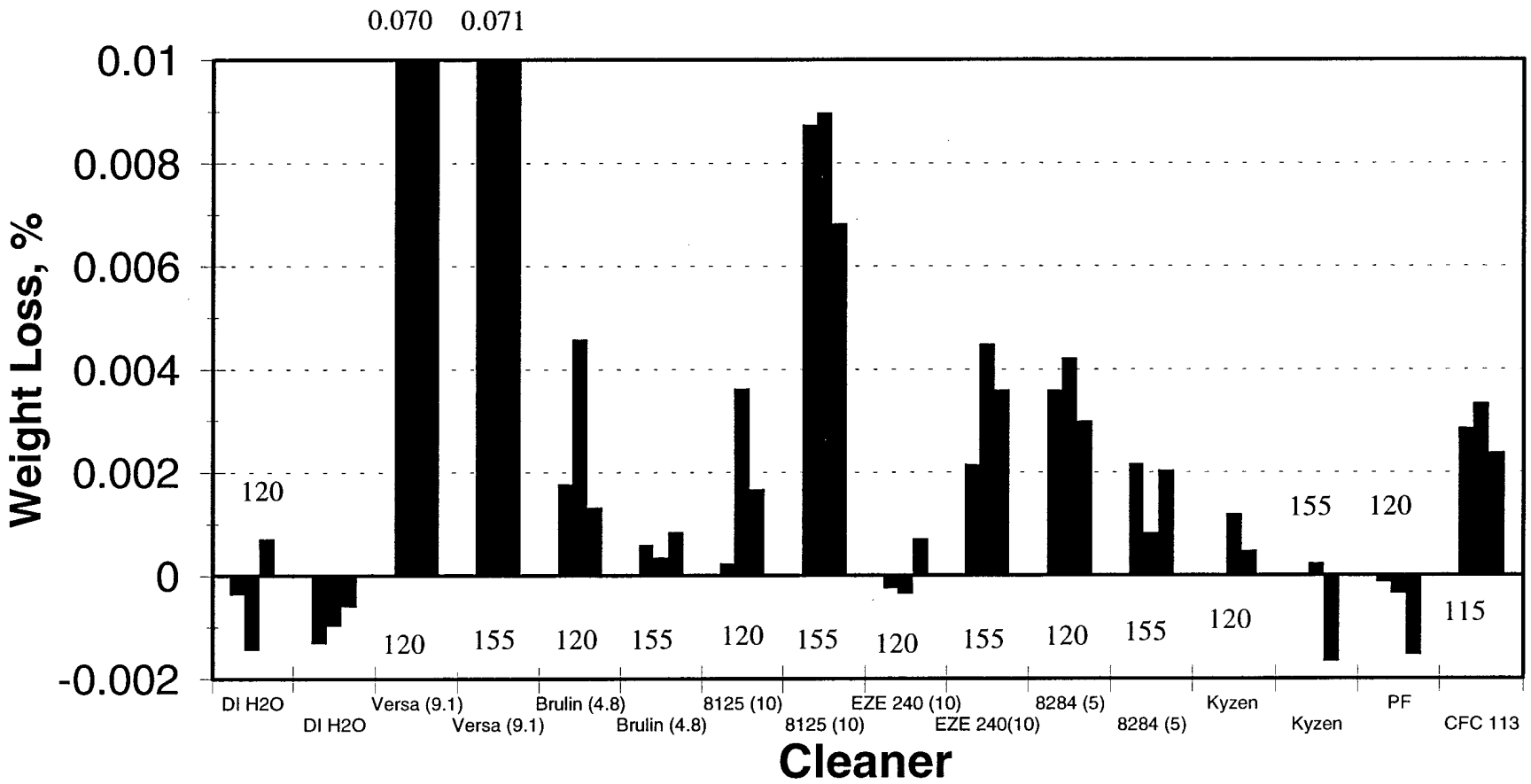
Sonication



4750_sonc_3

Wt. Loss for Aluminum AA2017

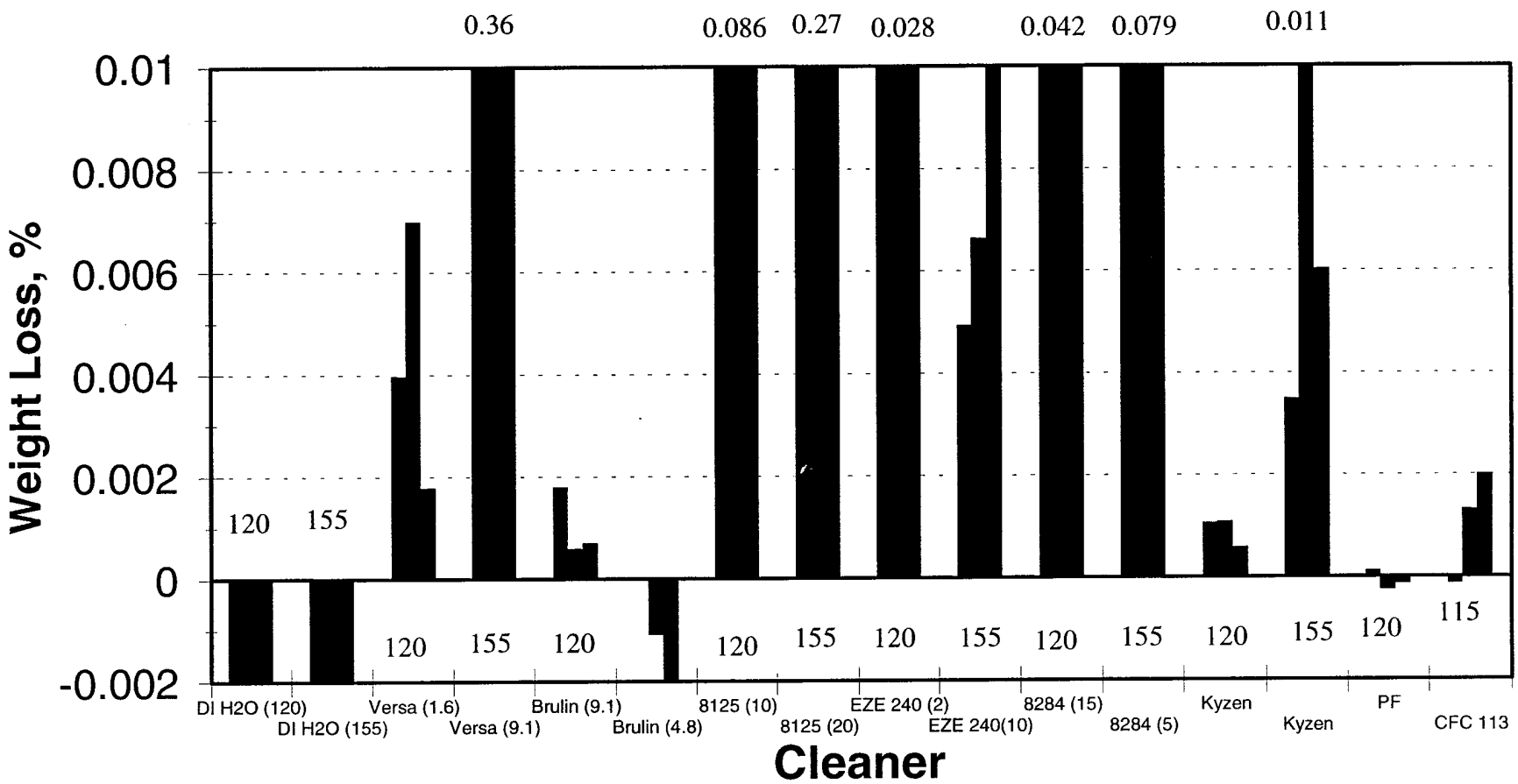
Sonication, 120°/155°F, Conc.=hi/low



2017_sonc_1

Wt. Loss for Aluminum AA2017

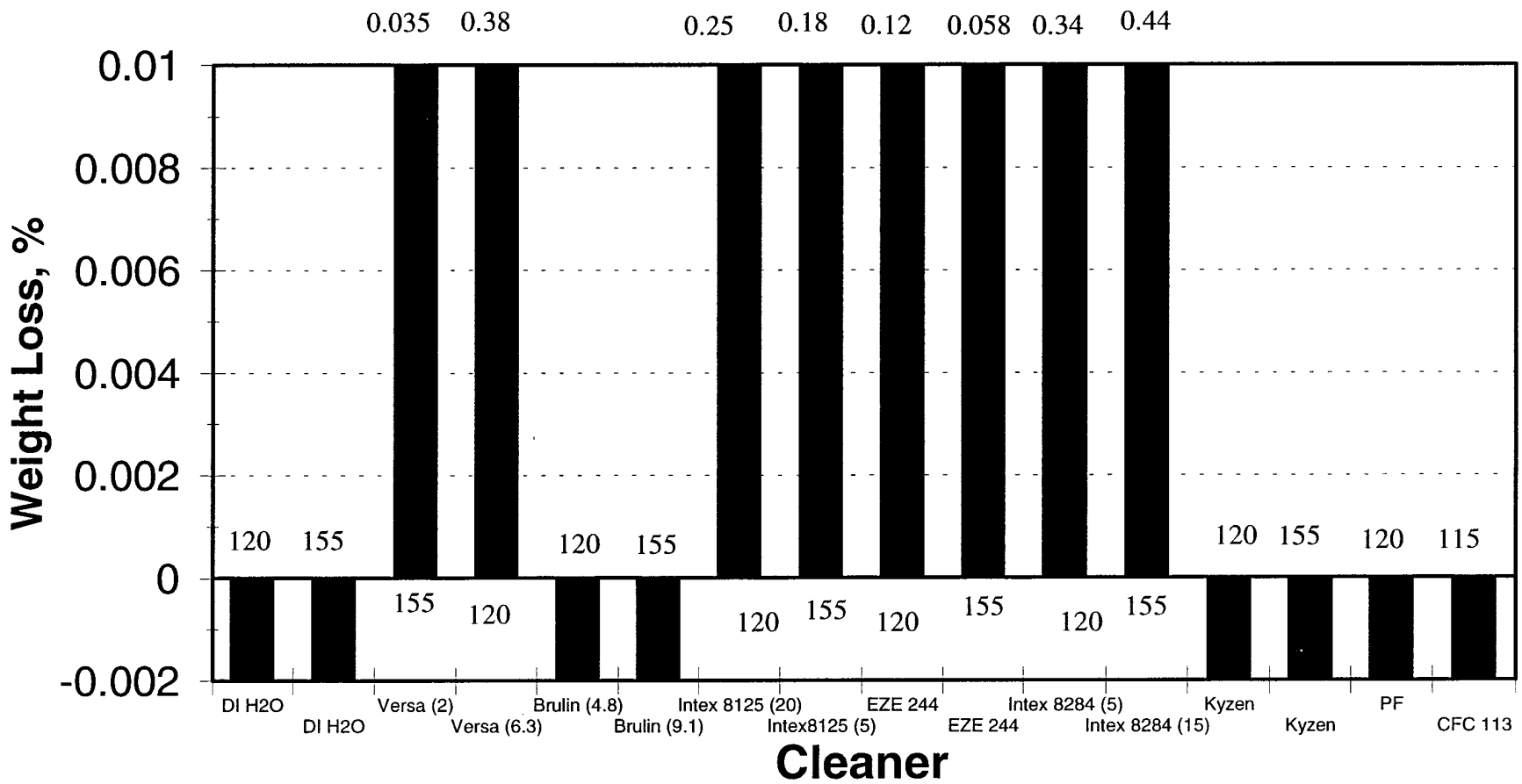
16-hr Soak, 120°/155°F, Conc.=hi/low



2017_soak_1

Wt. Loss for Anodized AA2017

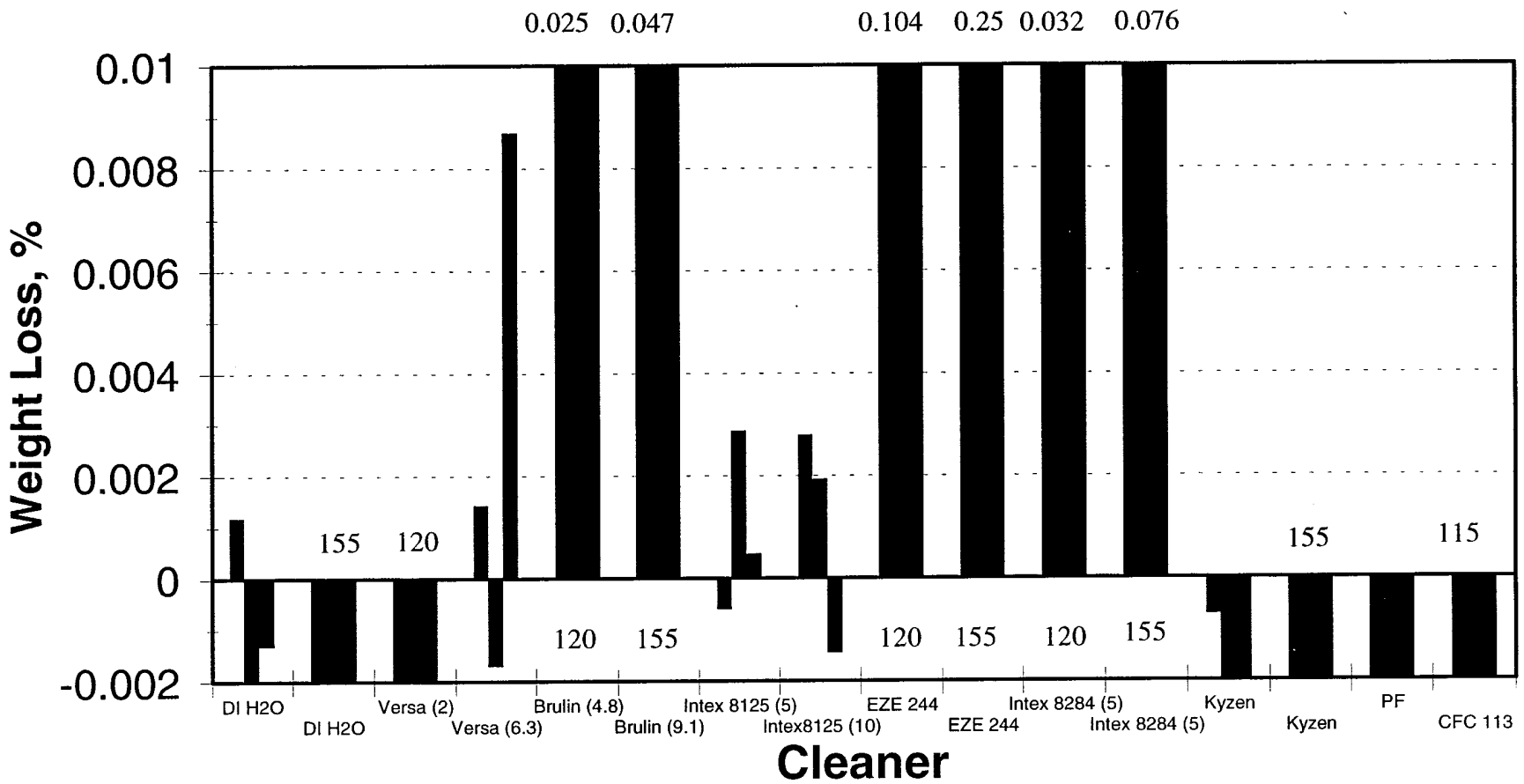
16-hour Soak



An2017_soak_3

Wt. Loss for Anodized AA2017

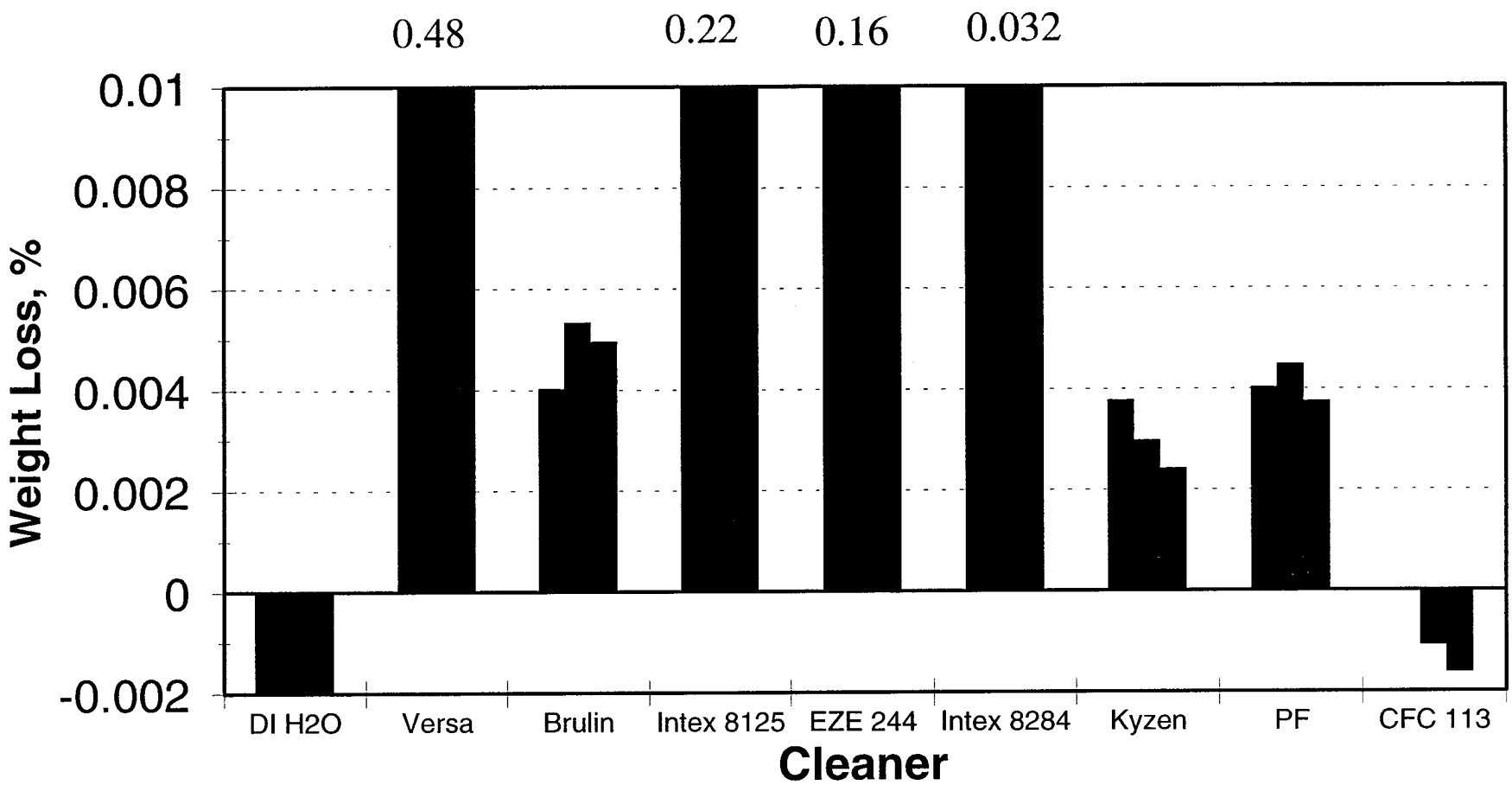
Sonication



An2017_sonc_3

Wt. Loss for Aluminum 6061

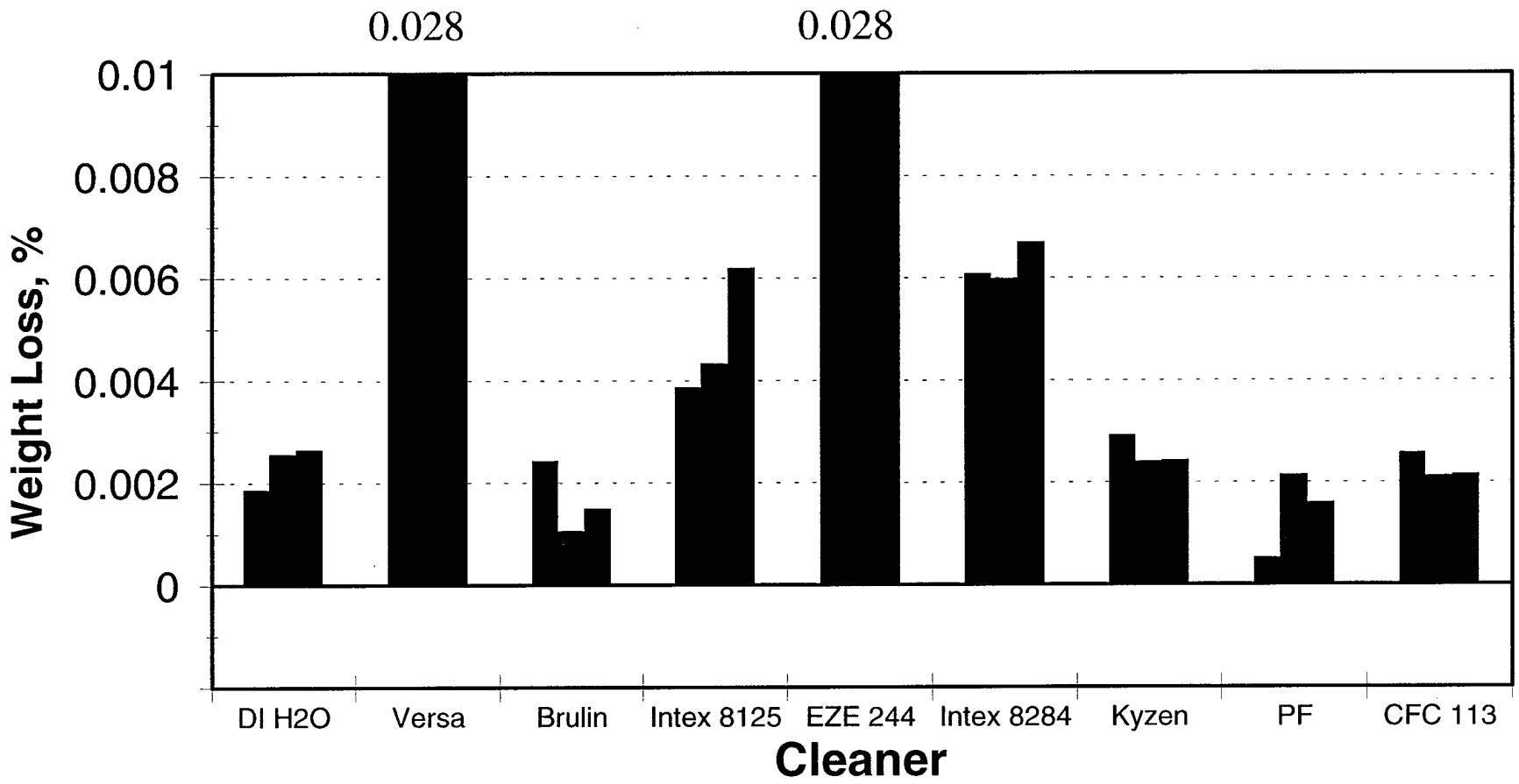
16-hr Soak, Temp = 120 F, Conc. = high



Al6061_16soak-4

Wt. Loss of Aluminum 6061

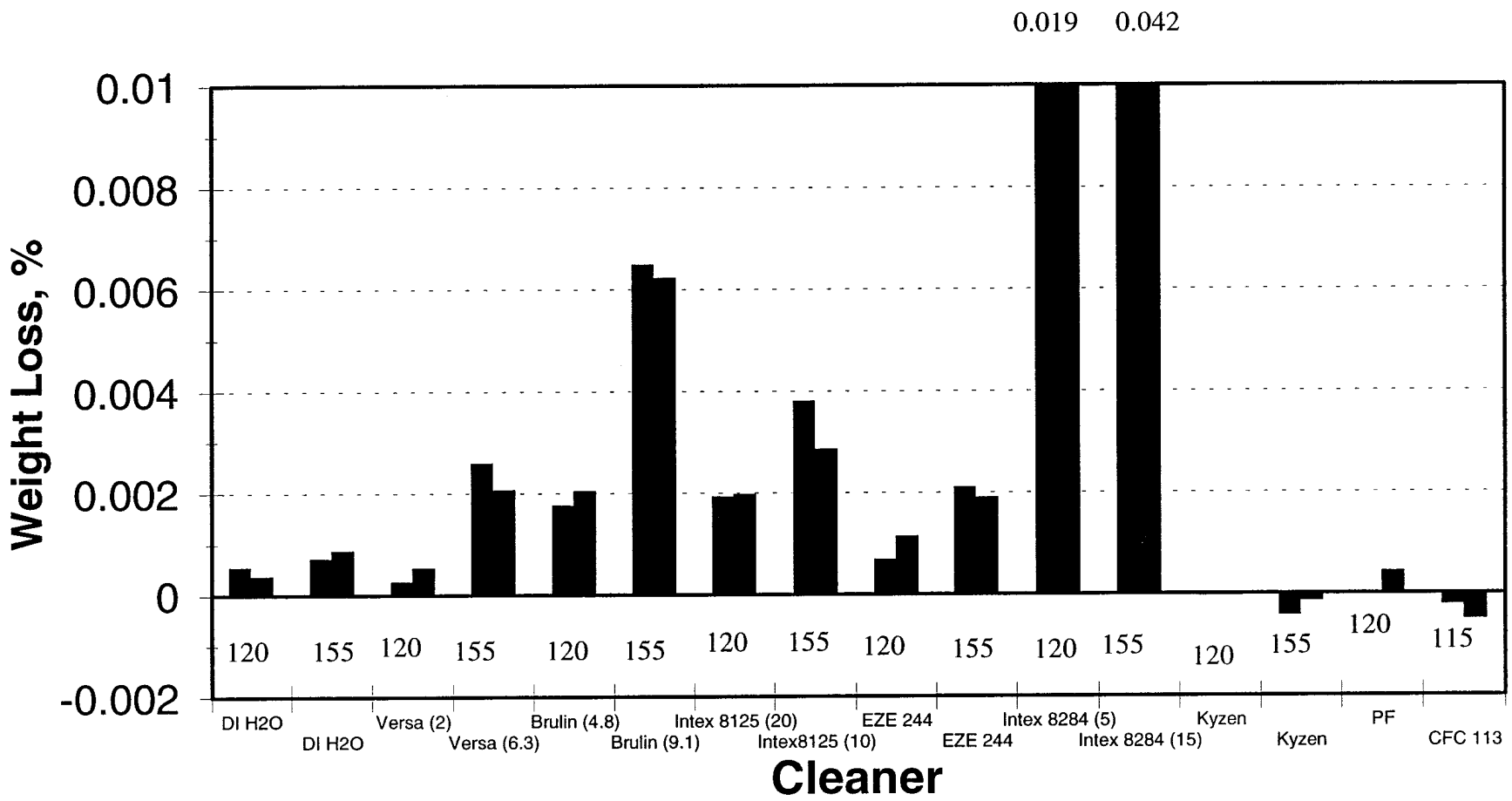
Sonication, Temp = 120 F, Conc. = high



Al6061_Sonc-4

Wt. Loss for Beryllium

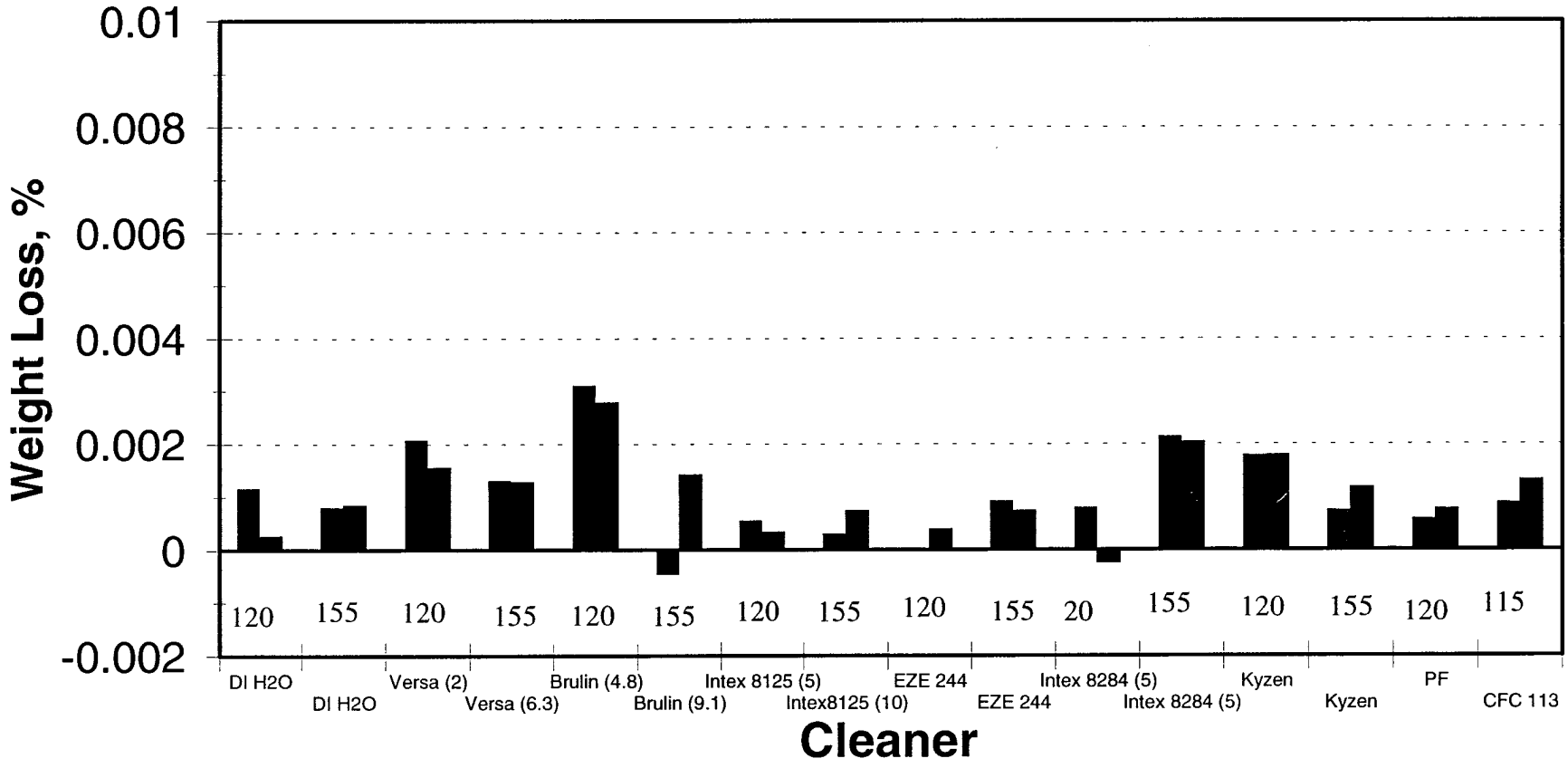
16-hr Soak, 120/155 F, Conc. = low/hi



Beryl_soak_3

Wt. Loss for Beryllium

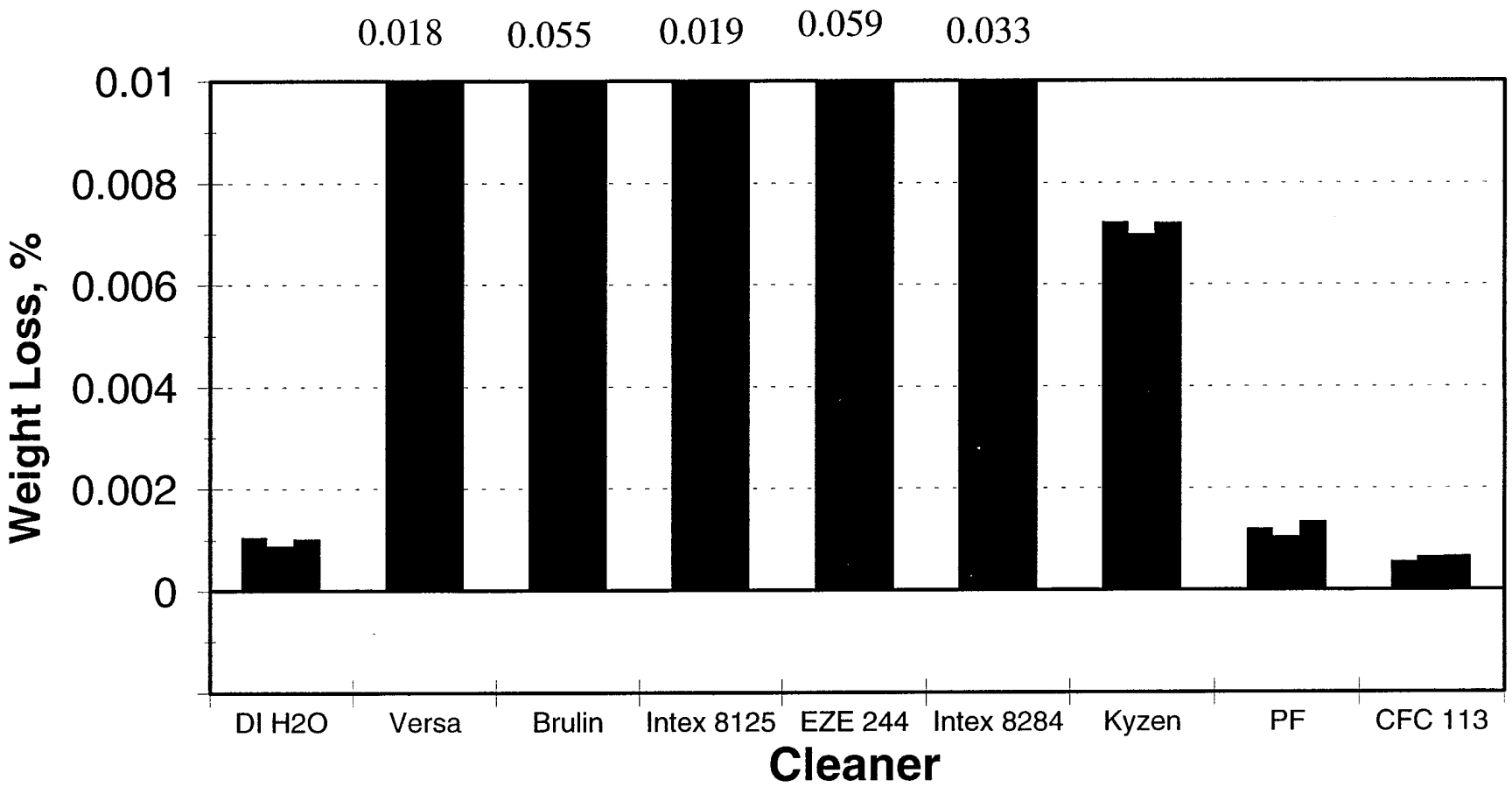
Sonication, 120/155 F, Conc. = low/hi



Beryl_sonc_3

Wt. Loss for Beryllium Copper

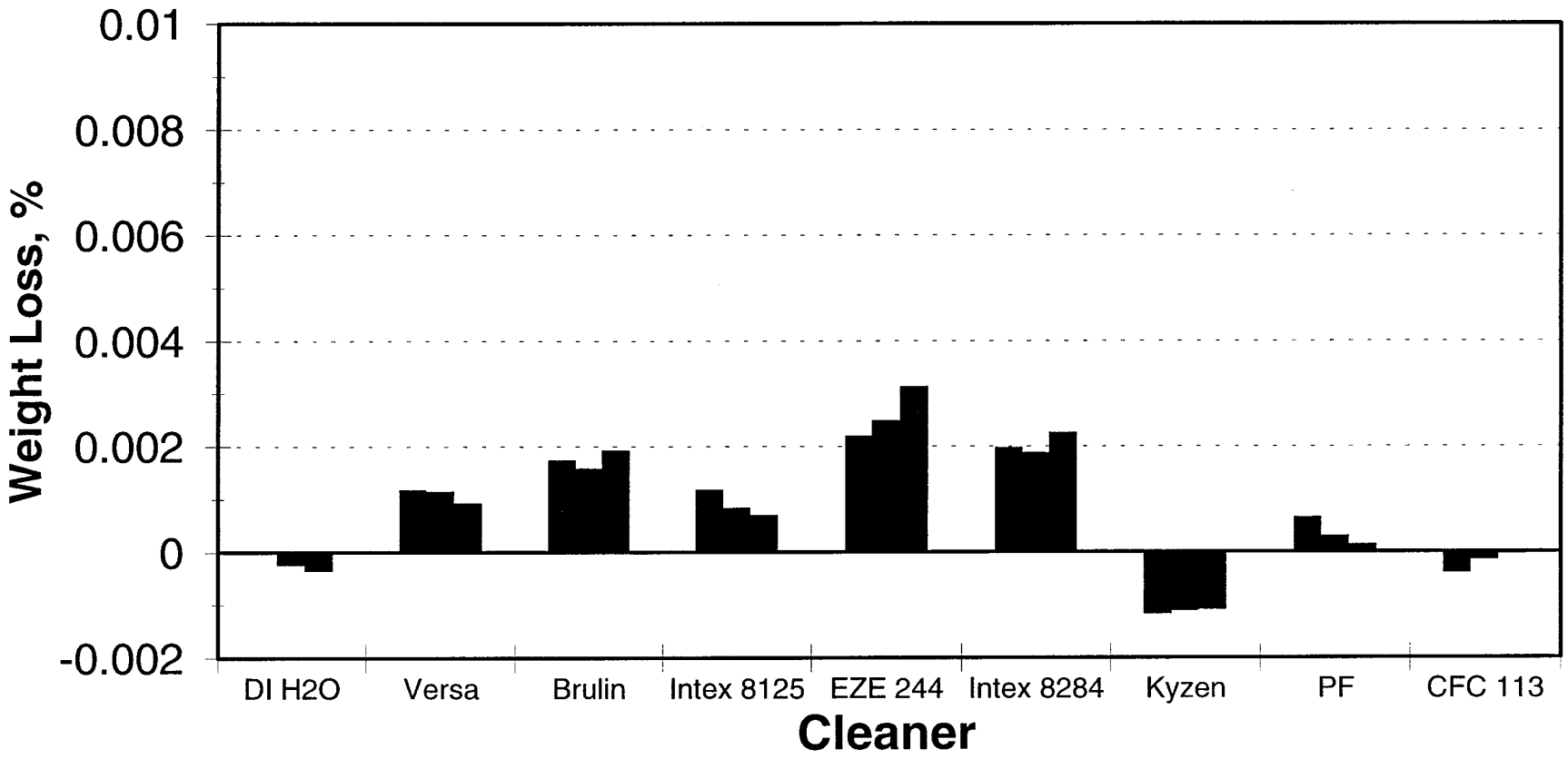
16-hr Soak, Temp = 120 F, Conc. = high



CDA172_16soak-4

Wt. Loss of Beryllium Copper

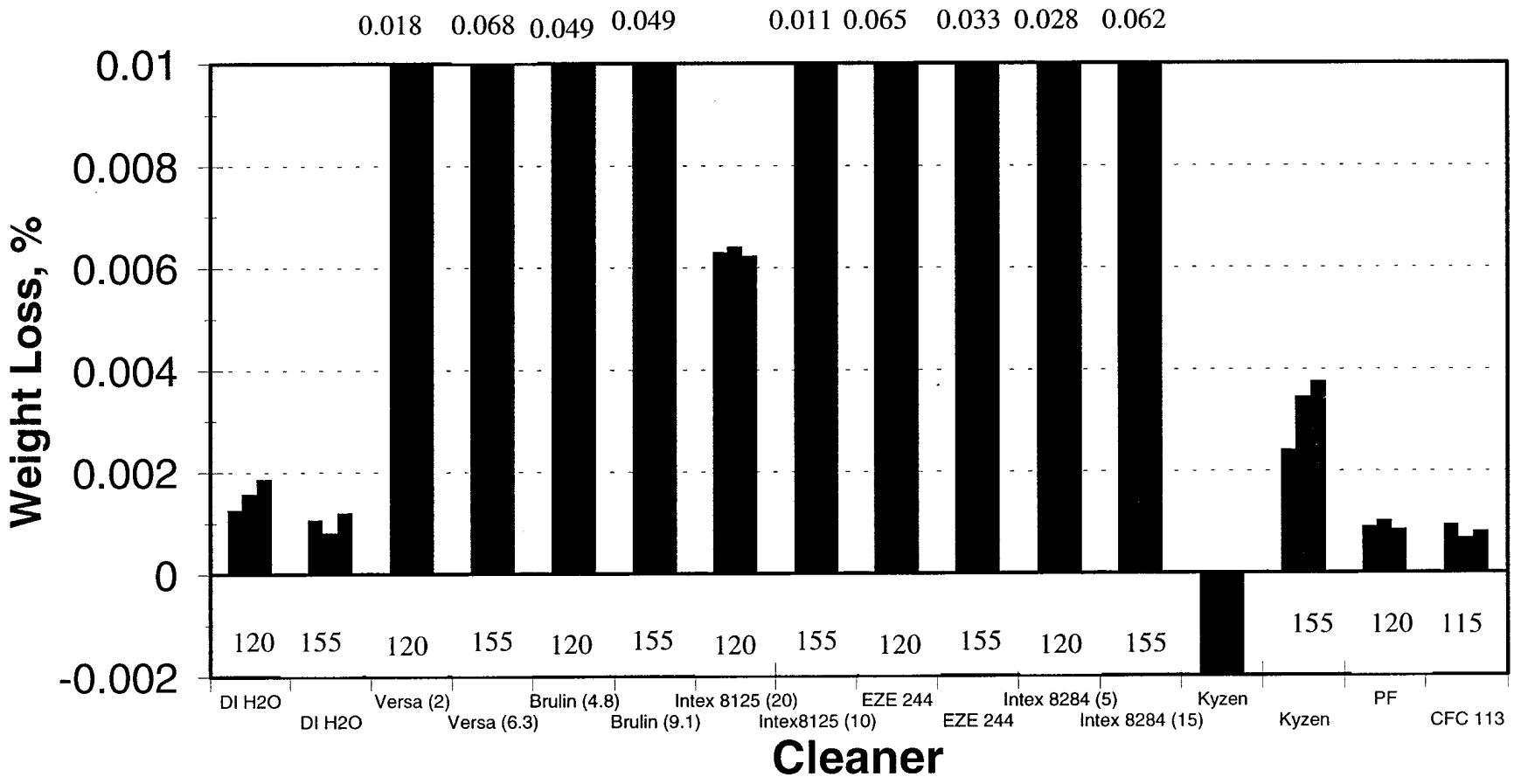
Sonication, Temp = 120 F, Conc. = high



CDA172_Sonc-4

Wt. Loss for Cartridge Brass

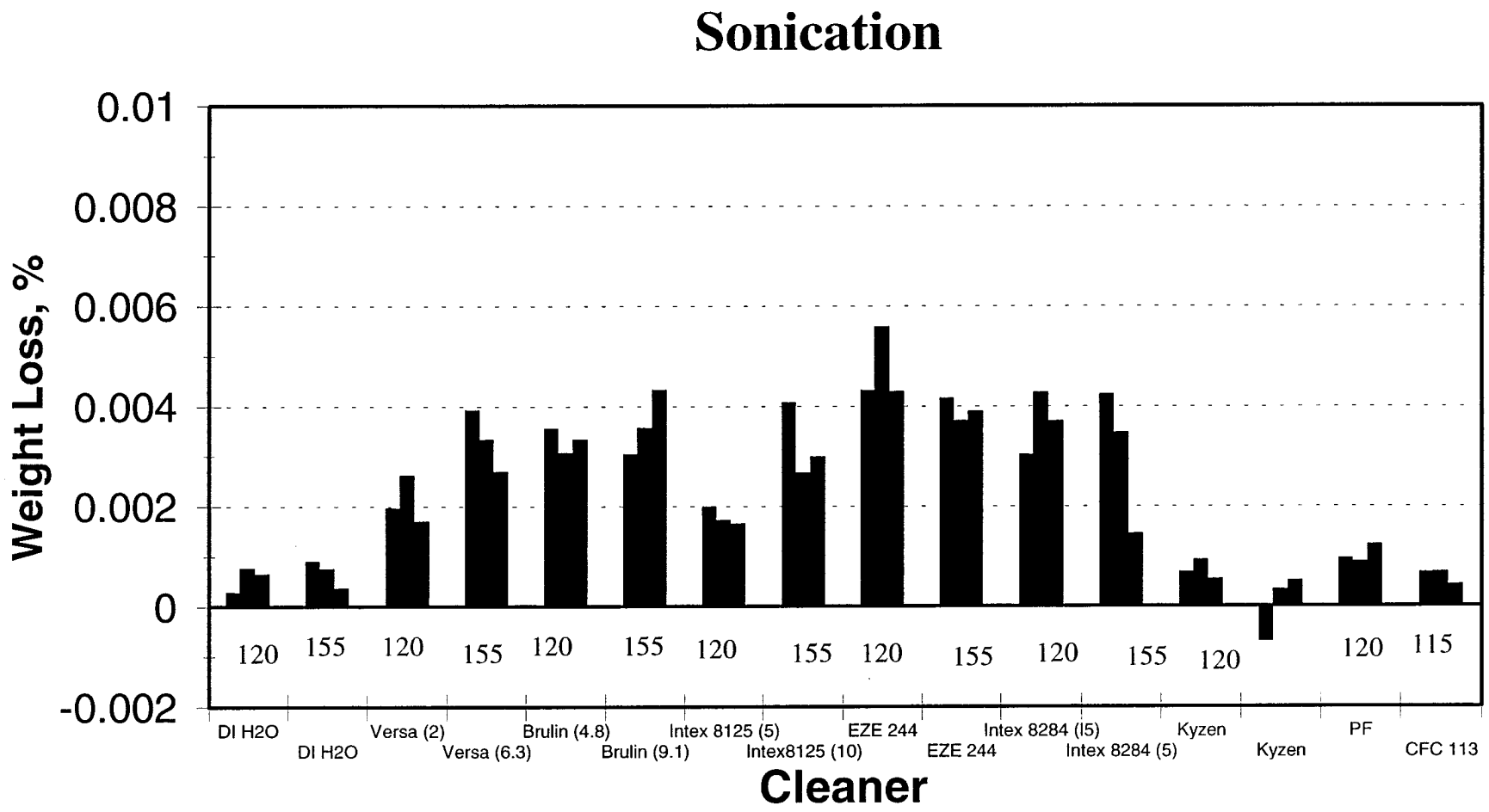
16-hour Soak



CDA260_soak_3

Wt. Loss for Cartridge Brass

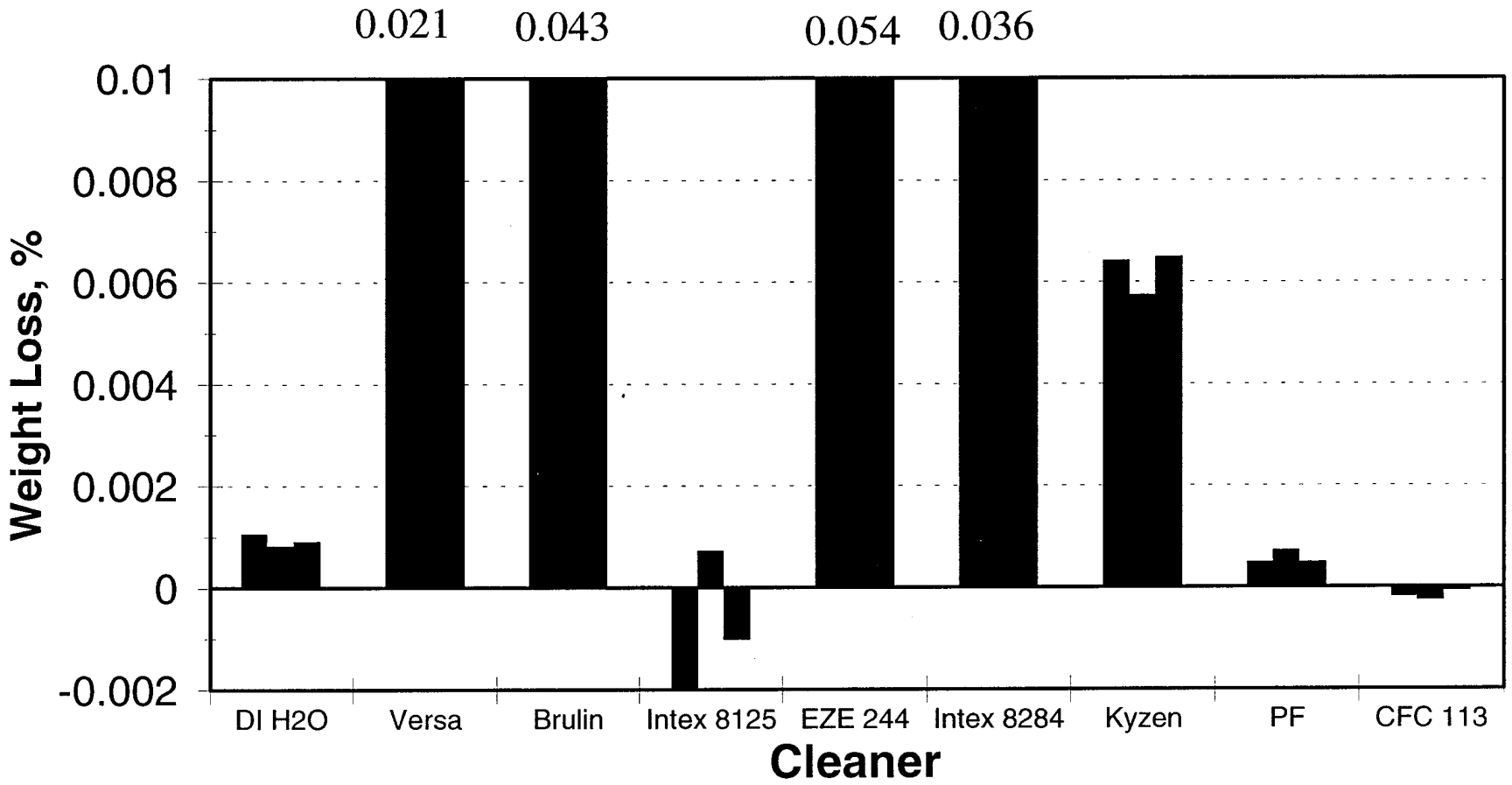
Temp = 120/155 F, Conc. = low/high



CDA260_sonc_3

Wt. Loss for Chromium Copper

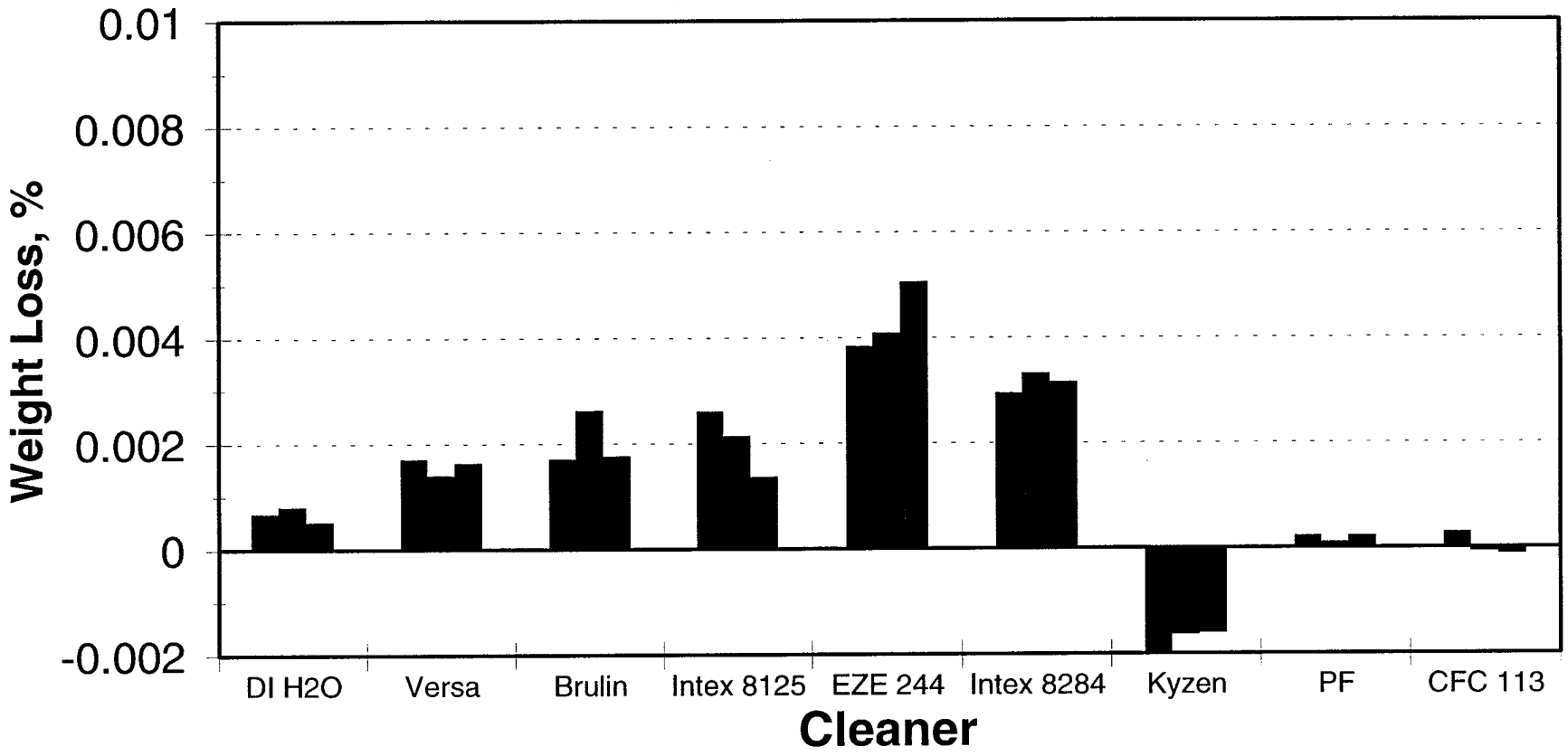
16-hr Soak, Temp = 120 F, Conc. = high



CDA182_16soak-4

Wt. Loss for Chromium Copper

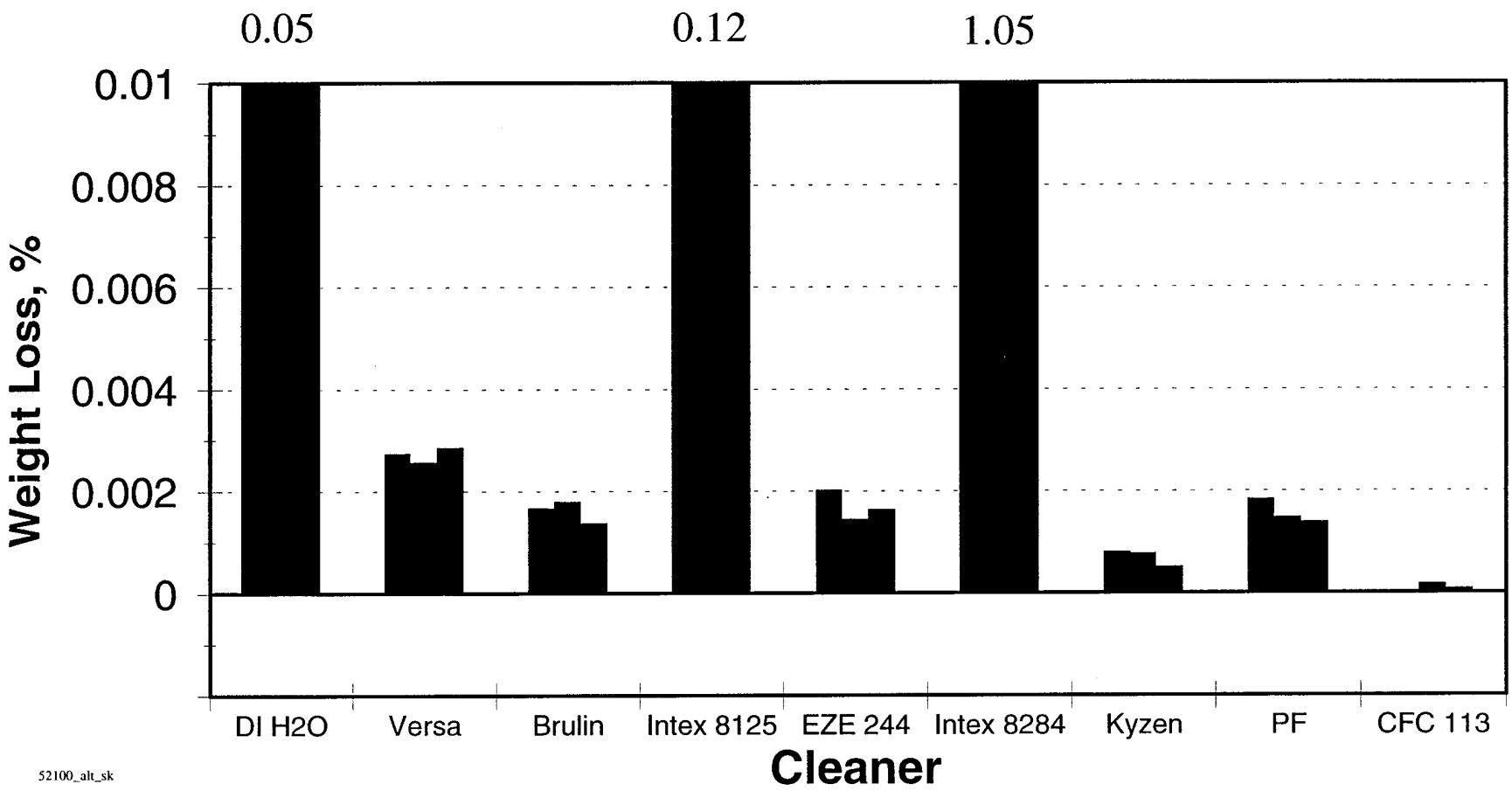
Sonication, Temp = 120 F, Conc. = high



CDA182_Sonc-4

Wt. Loss for Chromium Steel (52100)

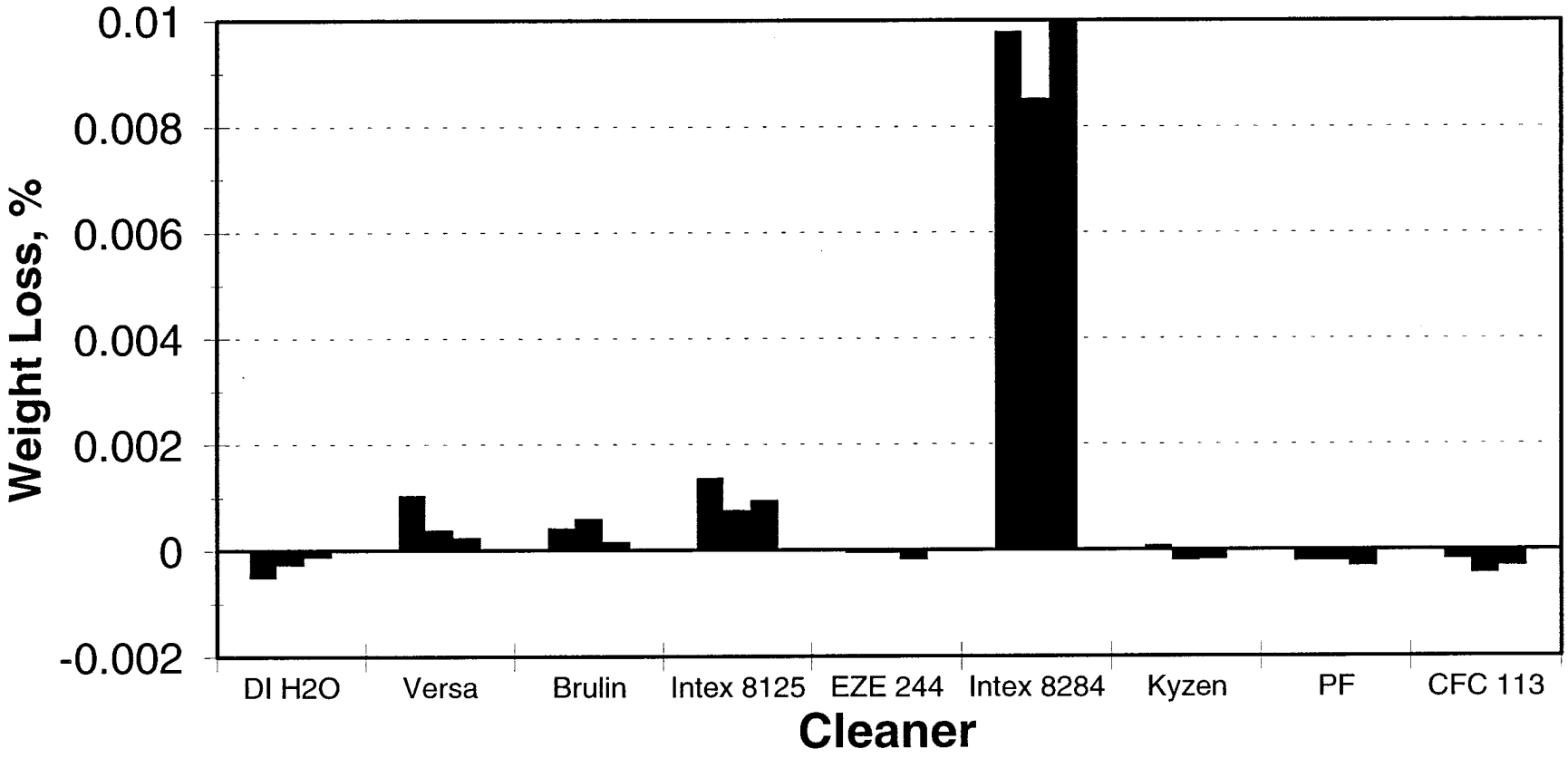
16-hr Soak, Temp = 120, Conc. = High



52100_alt_sk

Wt. Loss for Chromium Steel

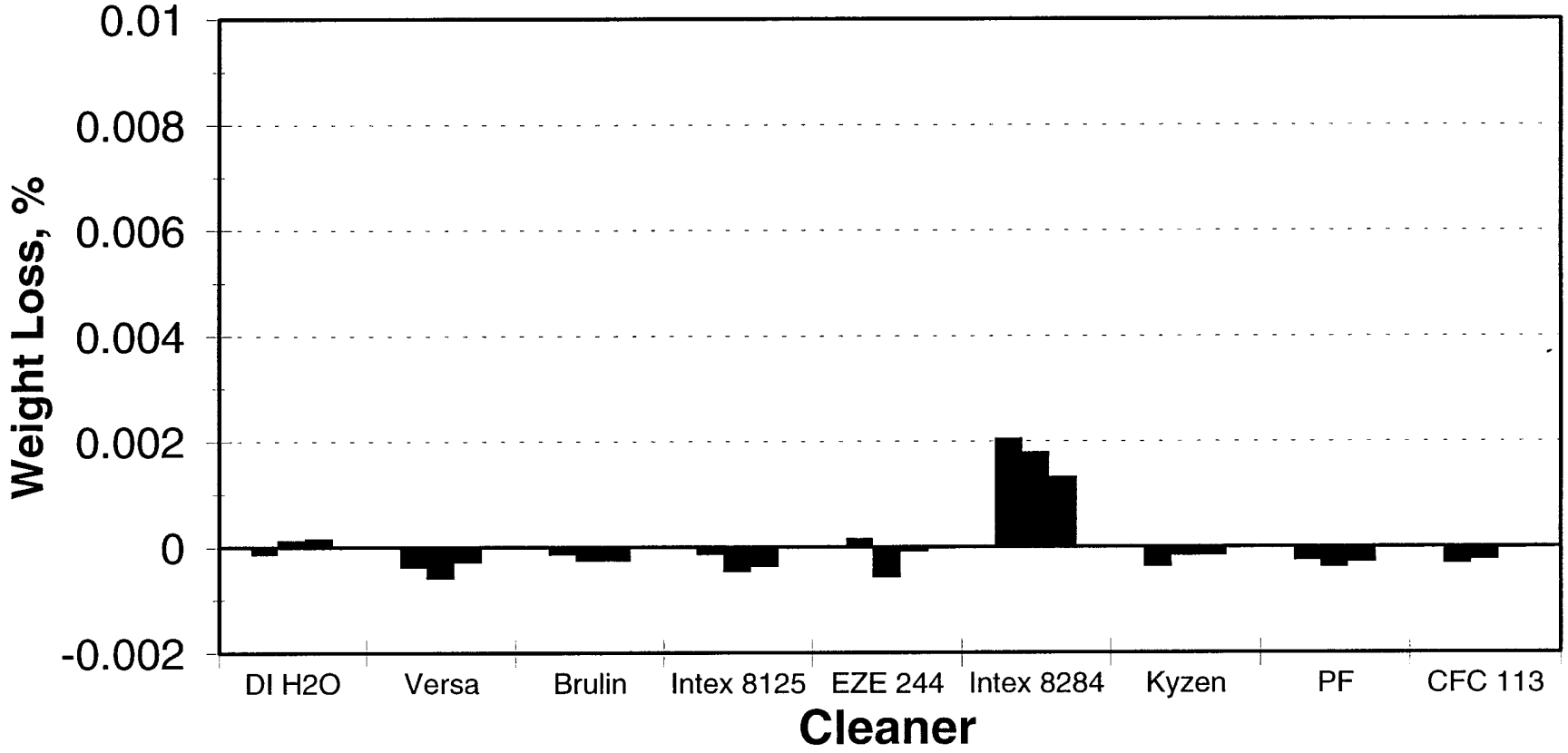
Sonication, Temp = 120 F, Conc. = high



52100_sonc-4

Wt. Loss for Gold-Plated Brass

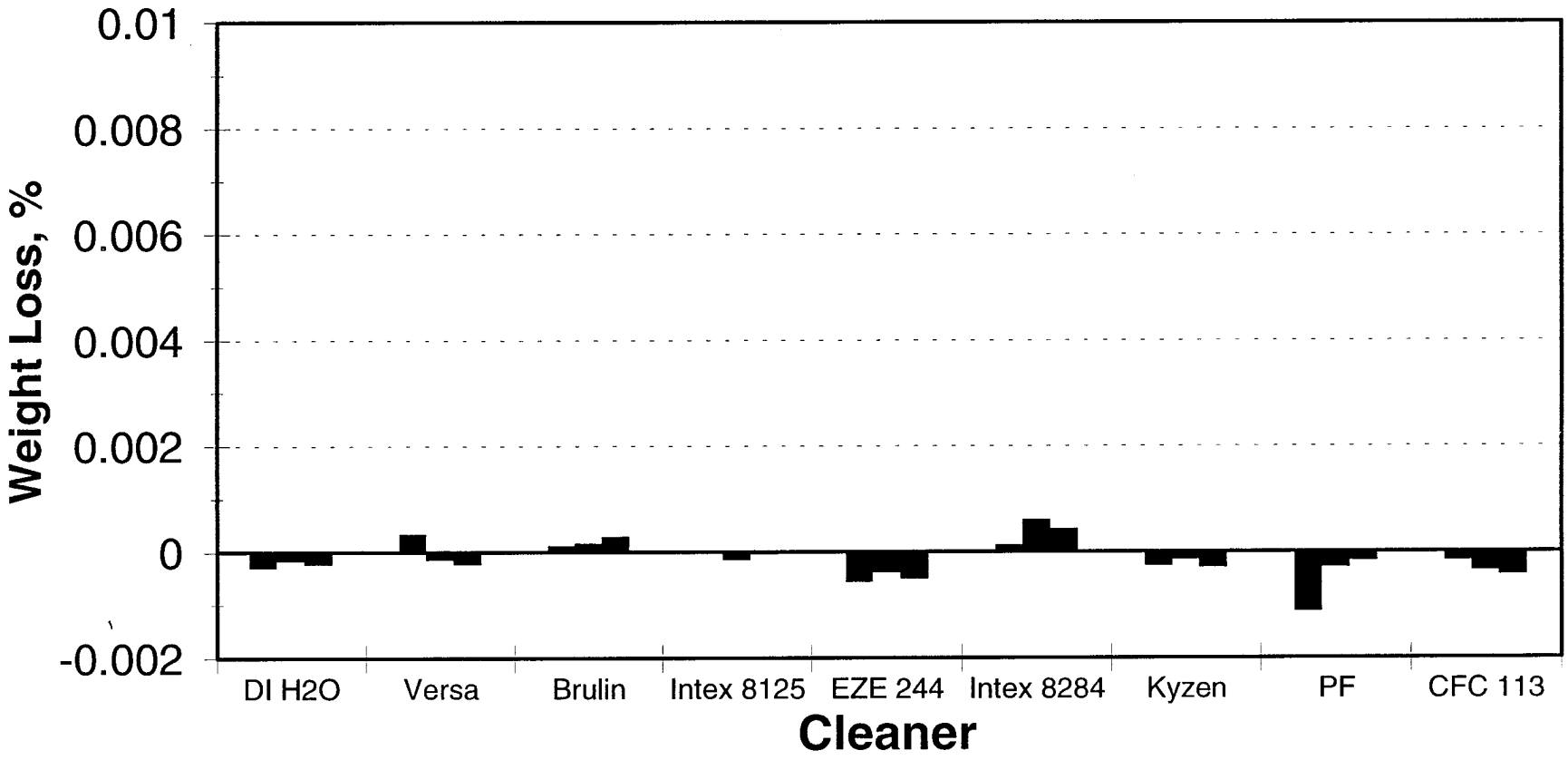
16-hr Soak, Temp = 120 F, Conc. = high



CDA260GP_16sk-4

Wt. Loss for Gold-Plated Brass

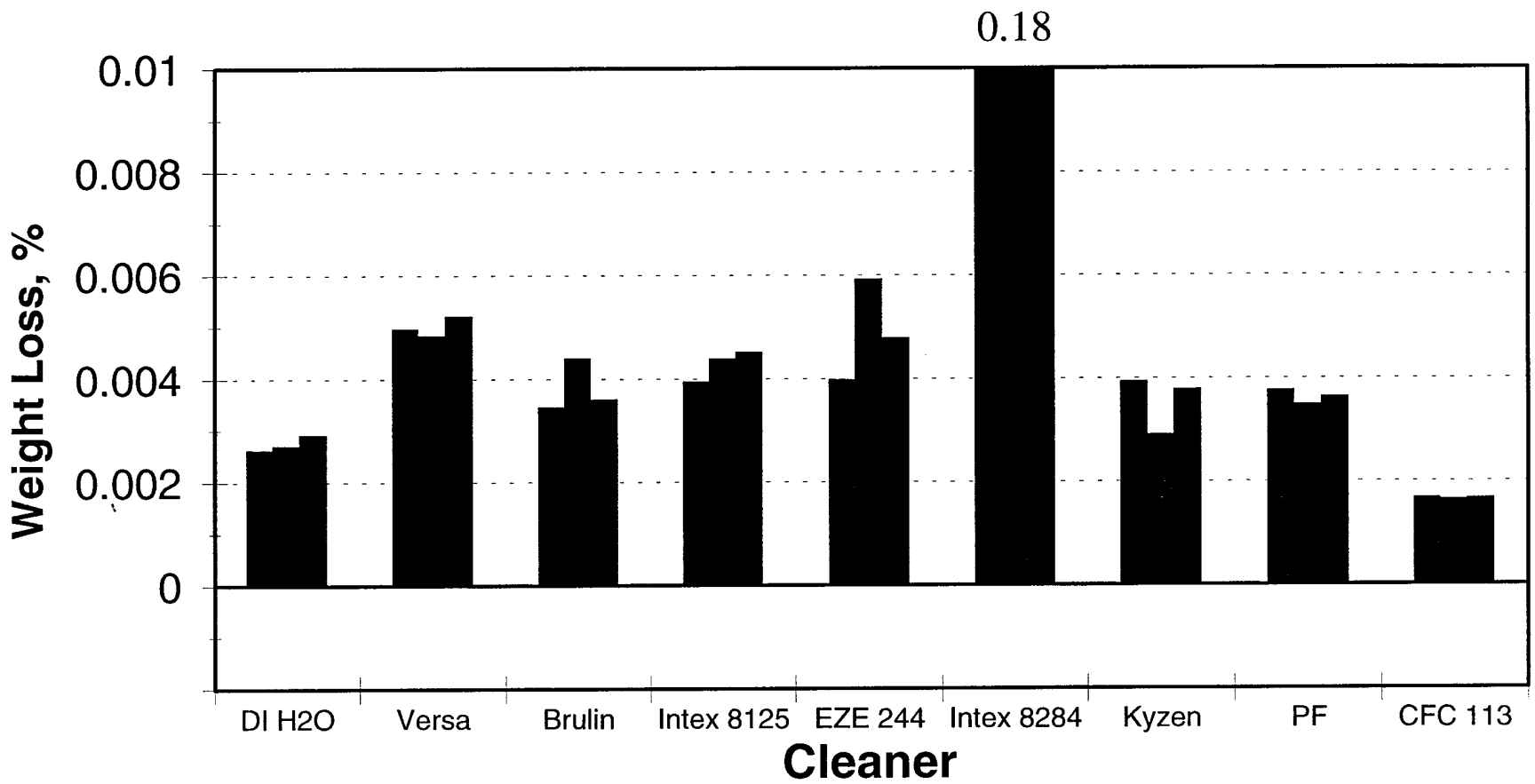
Sonication, Temp = 120 F, Conc. = high



CDA260GP_Sonc-4

Wt. Loss for HyMu77

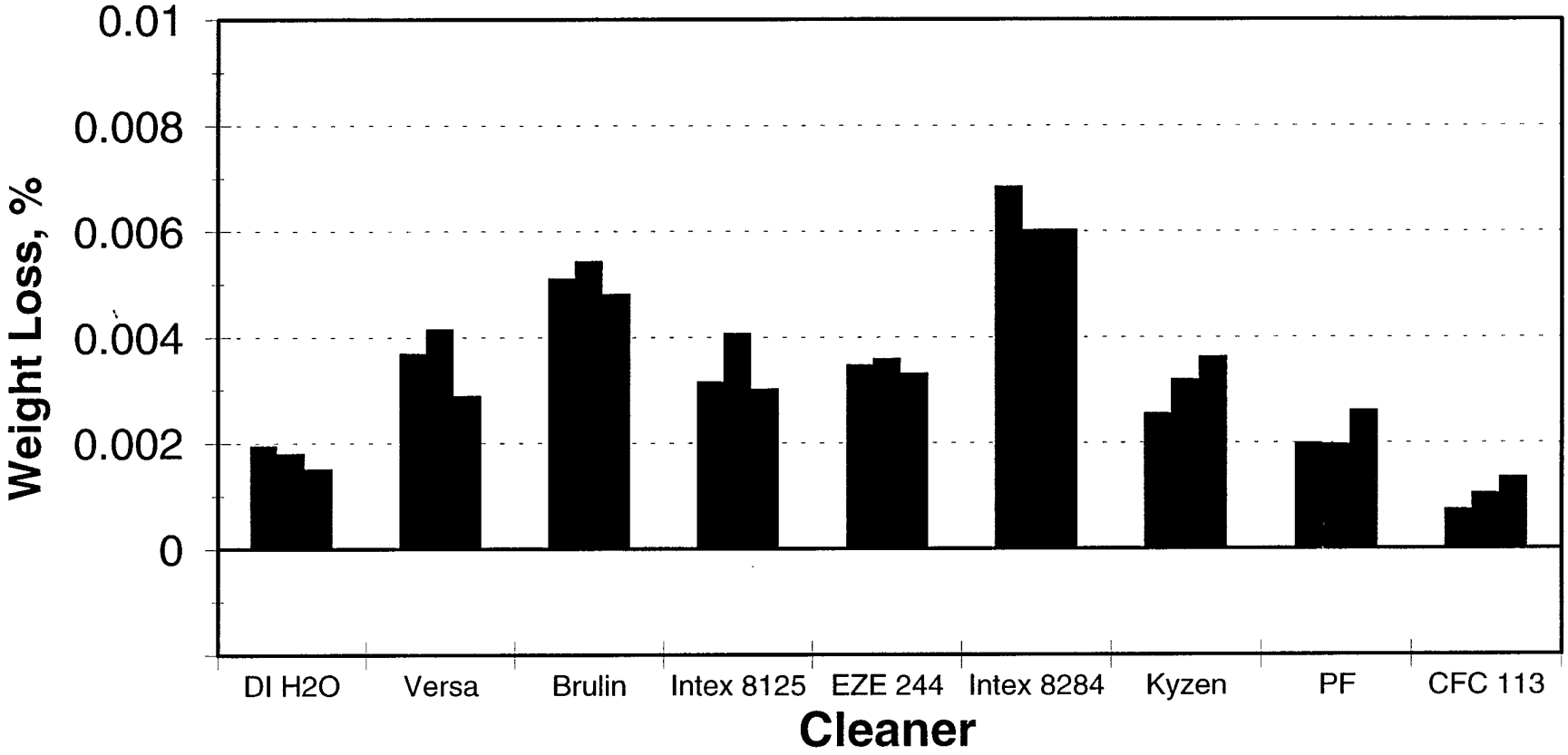
16-hr Soak, Temp = 120 F, Conc. = high



HYMU77_16soak-4

Wt. Loss for HyMu77

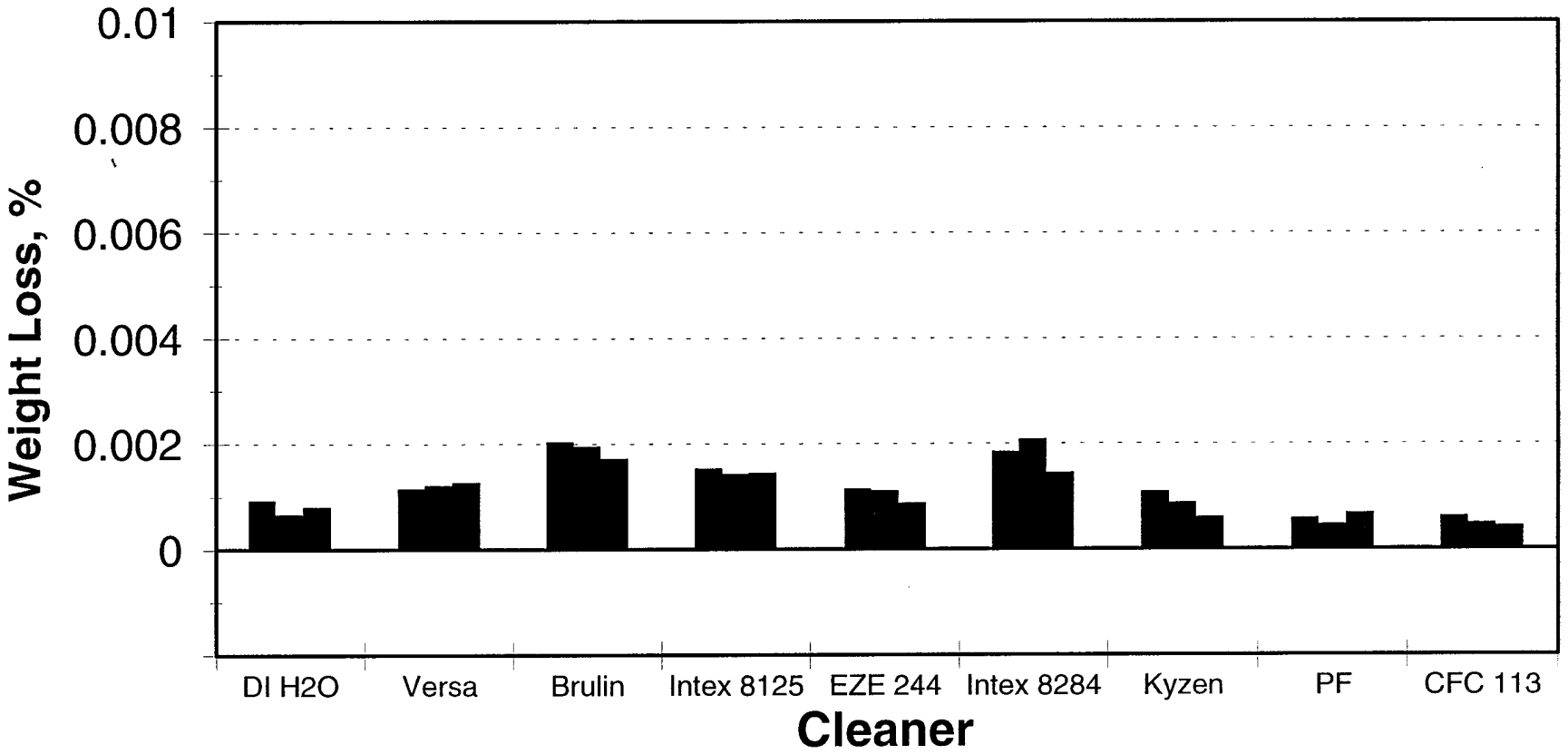
Sonication, Temp = 120 F, Conc. = high



HYMU77_Sonc-4

Wt. Loss for Inconel 600

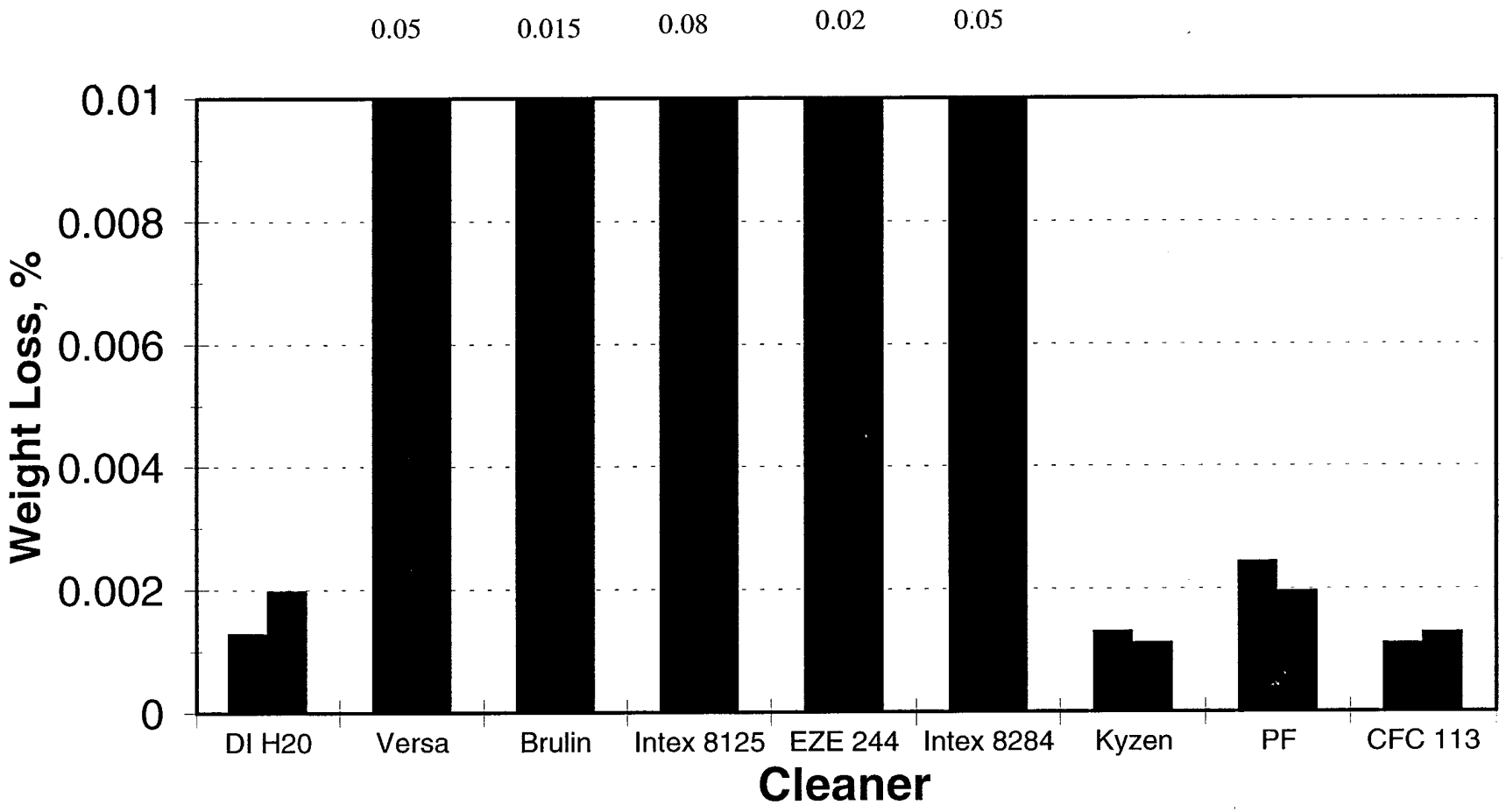
Sonication, Temp = 120 F, Conc. = high



I600_sonc-4

Wt. Loss for 60Sn-40Pb Solder

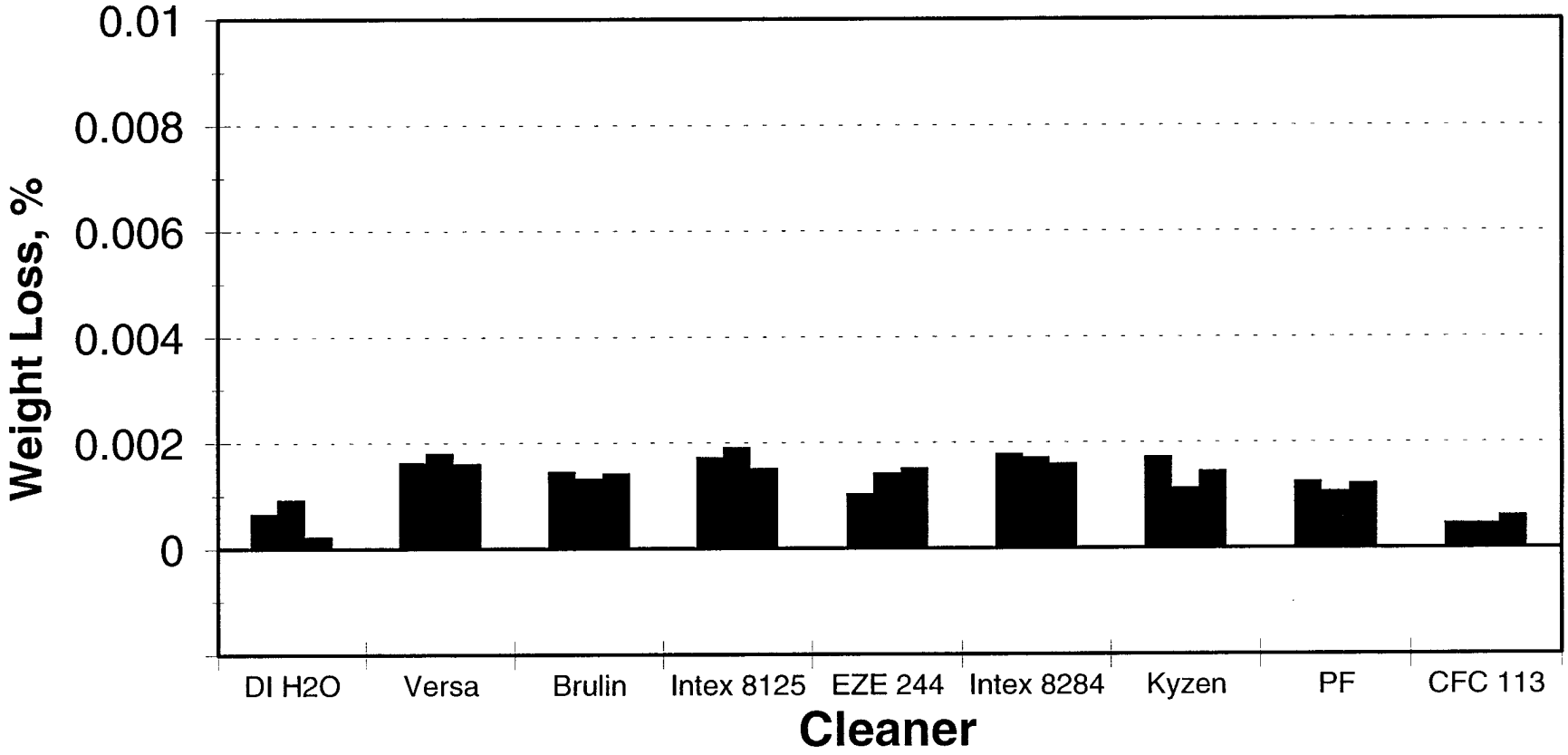
1-hr Soak, 120°F, Conc.= high



60_40_1_hr_sk

Wt. Loss for Type 304 S.S.

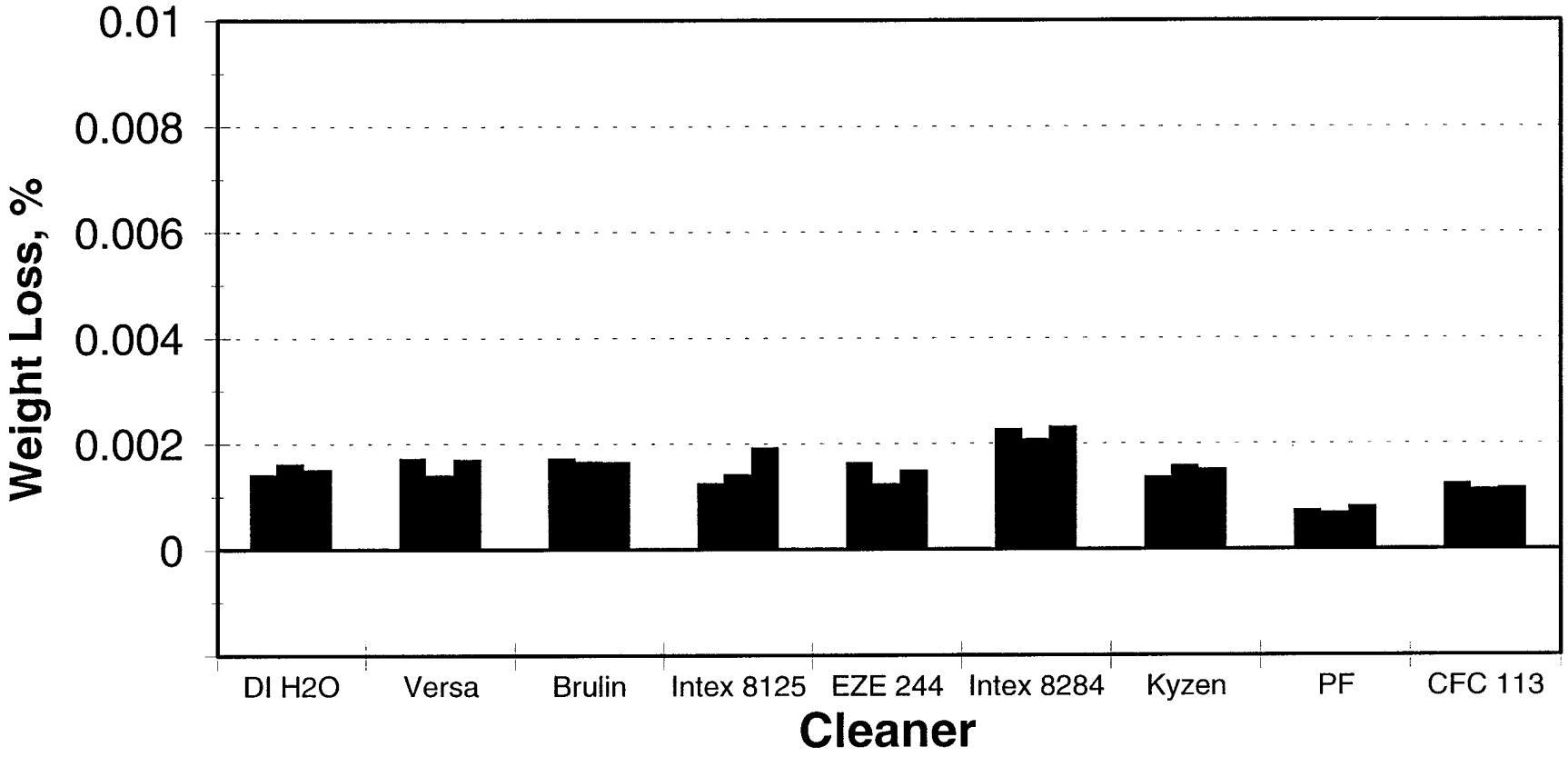
16-hr Soak, Temp = 120 F, Conc. = high



304_16soak-4

Wt. Loss for Type 304 S.S.

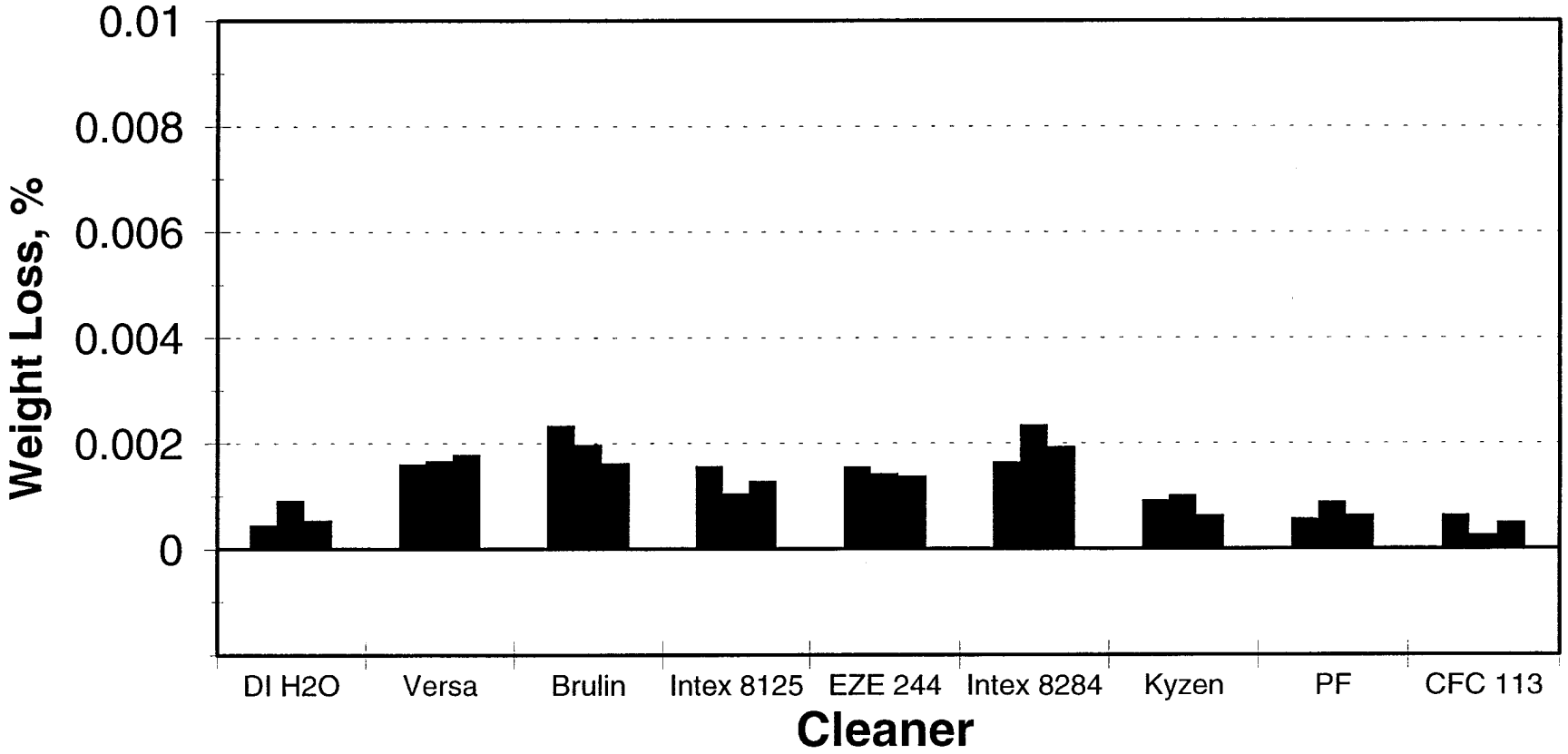
Sonication, Temp = 120 F, Conc. = high



304_sonc-4

Wt. Loss for Type 316 S.S.

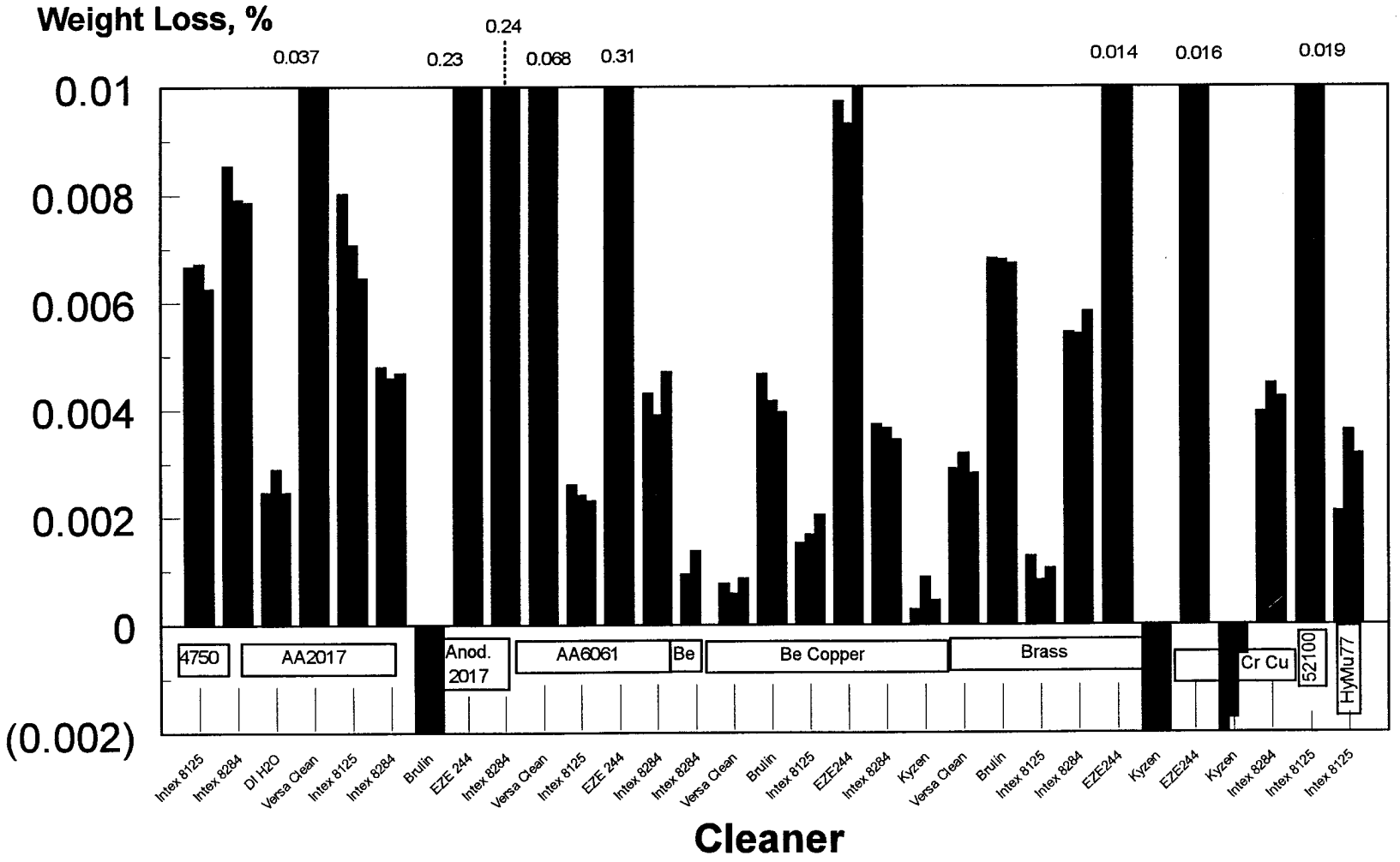
Sonication, Temp = 120 F, Conc. = high



316_sonc-4

All One-Hour Soak Test Data

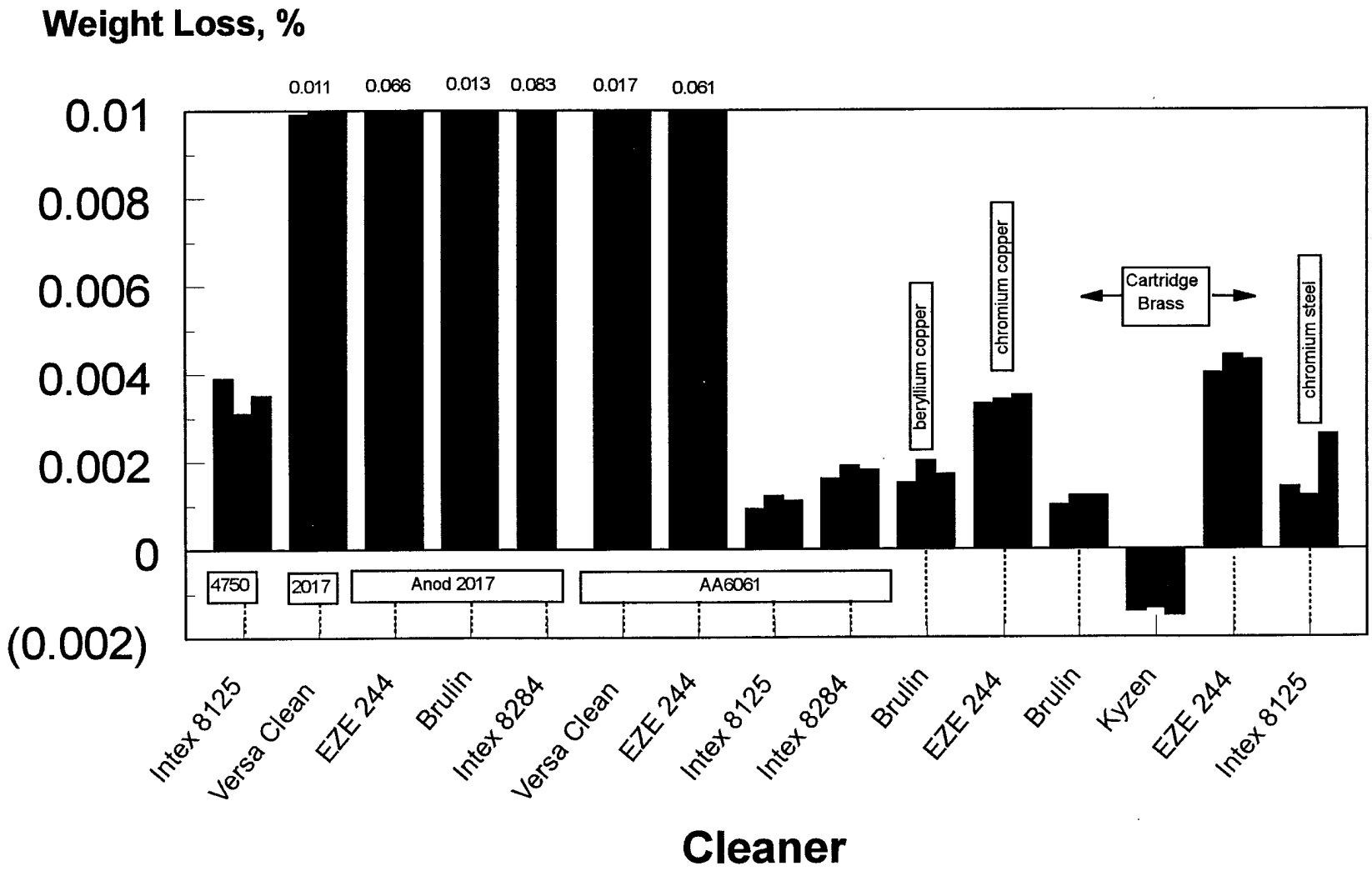
120 F, Conc. = high



1hr_fnl.pre

All Ten-Minute Soak Test Data

120 F, high concentraton

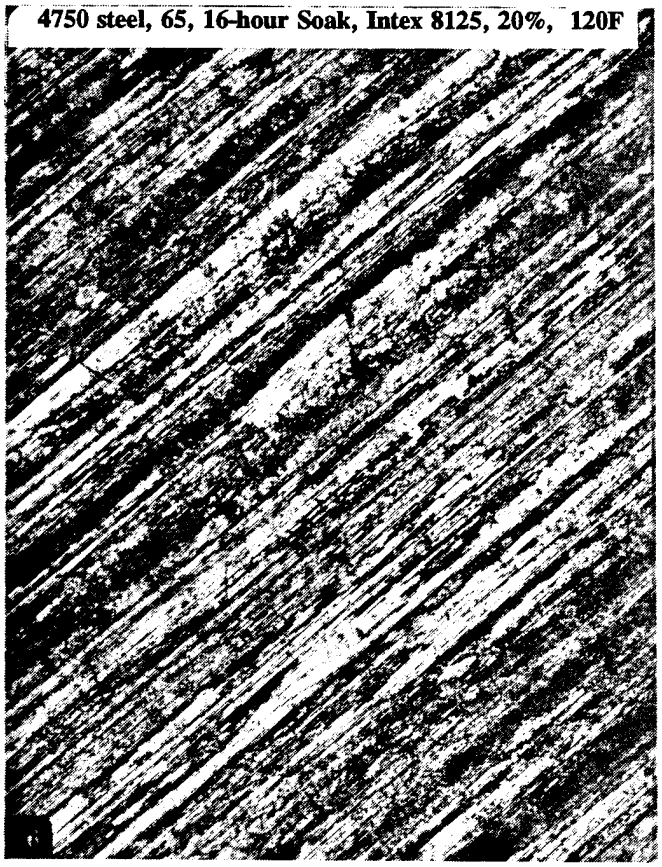


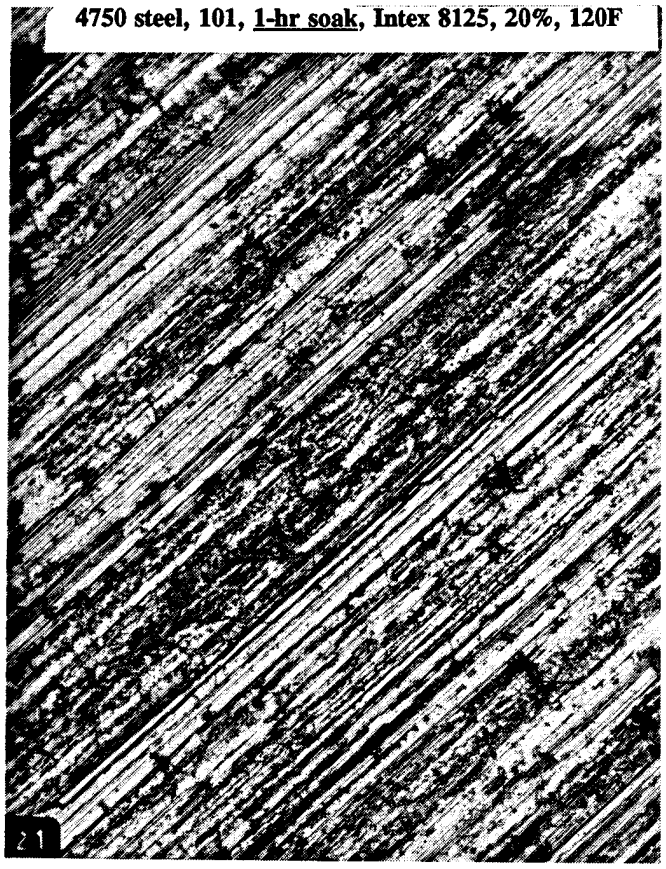
10minfnl.pre

Appendix J

Photomicrographs of Metals Exhibiting Incompatibility

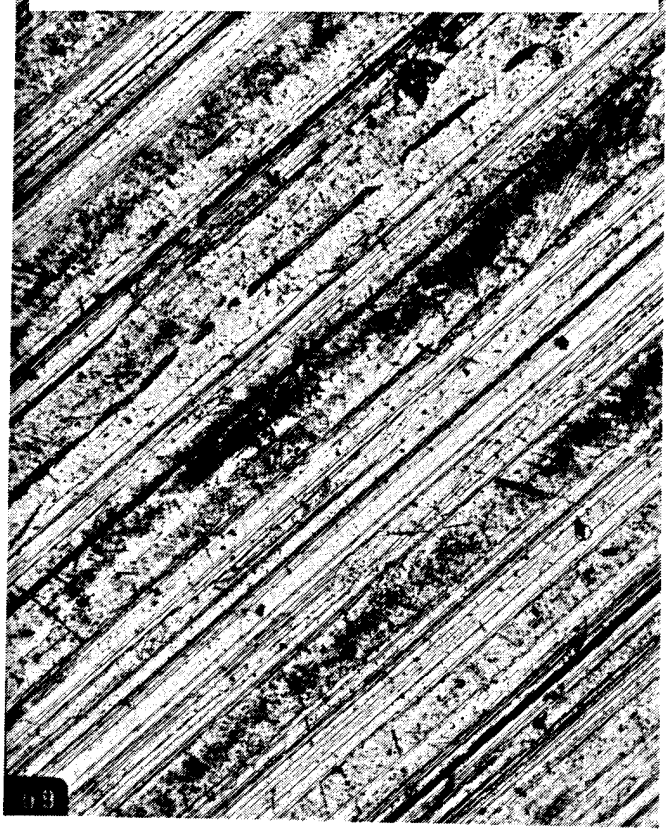
The photomicrographs are arranged alphabetically by alloy name. The first photograph of each alloy group is the baseline condition of the coupon's surface prior to testing. The magnification of all the photographs is 200X (one centimeter on the photograph equals 0.05 mm or 50 μm). The caption on each photograph, other than the baseline, lists the alloy name, coupon number, cleaning method, cleaner name, cleaner concentration, and test temperature, respectively.



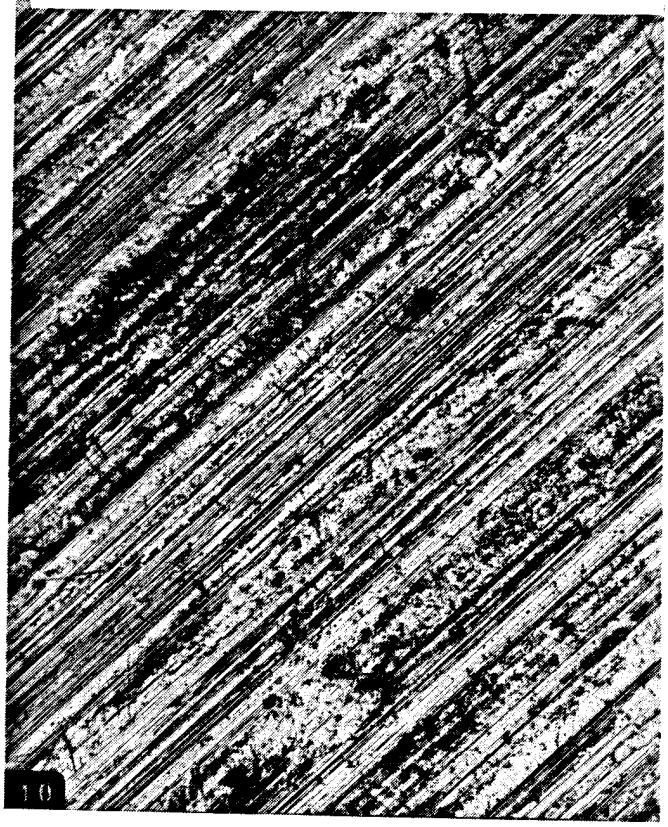


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

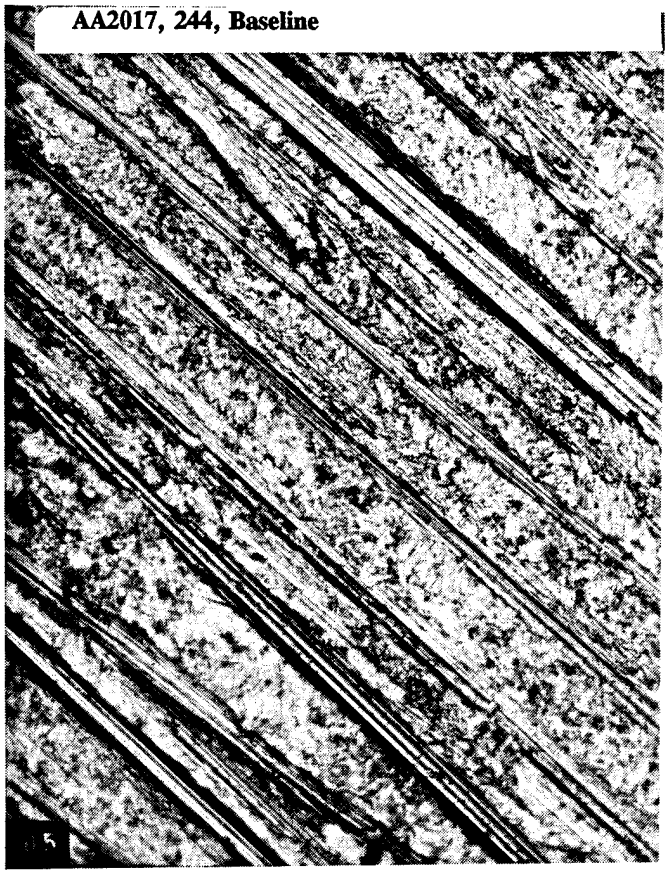
4750 steel, 68, 16-hour Soak, Intex 8284, 5%, 120F

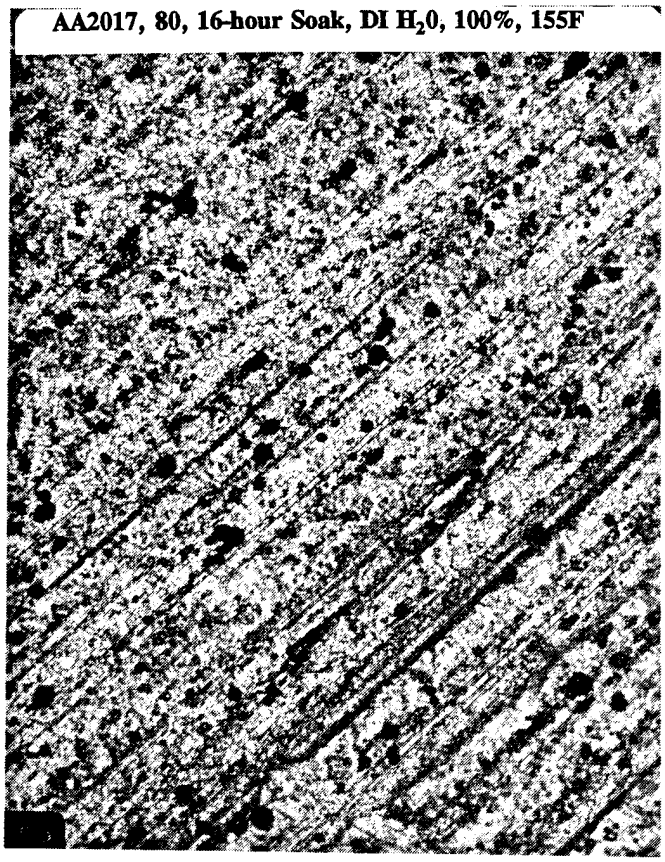


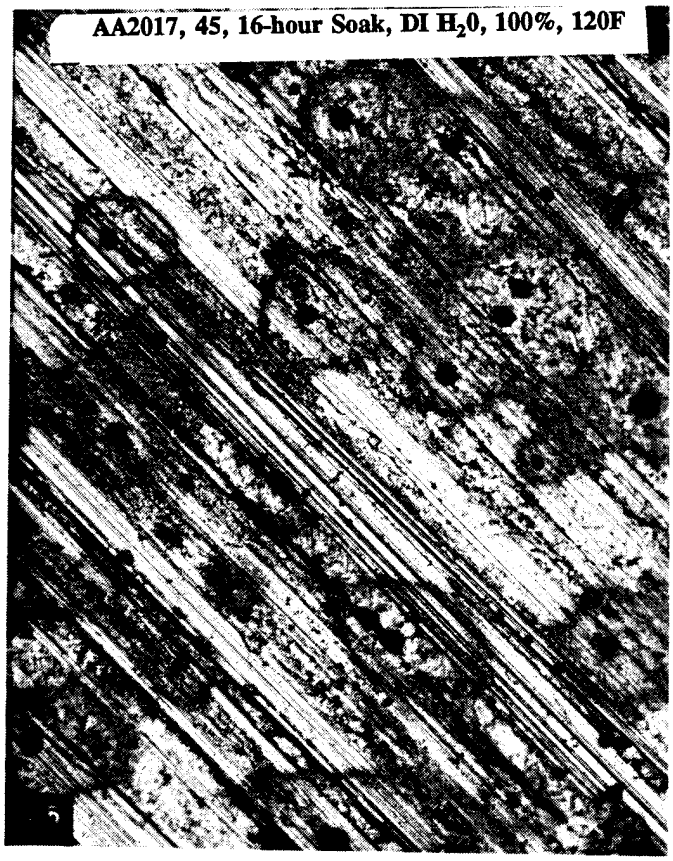
4750 steel, 92, 16-hour Soak, Intex 8284,15%, 155F



Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

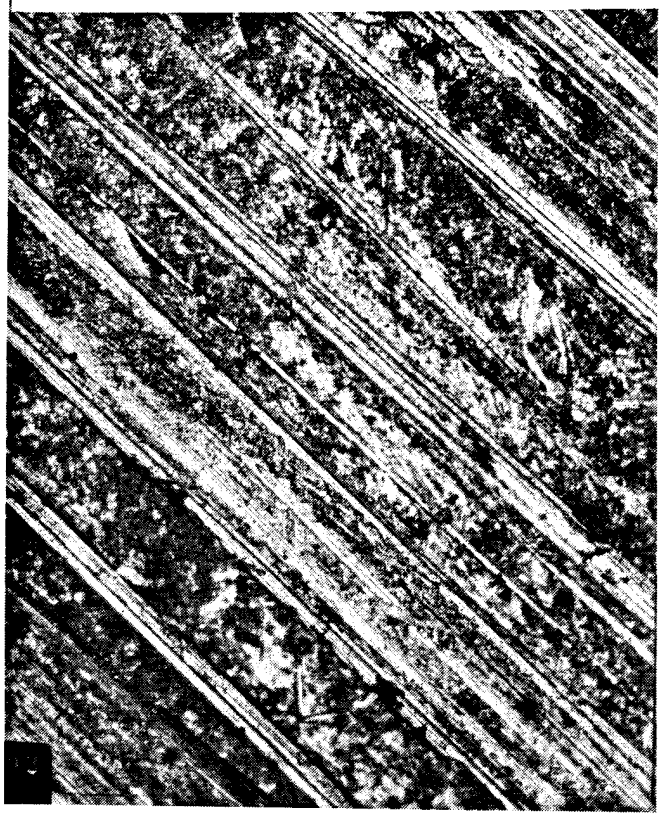




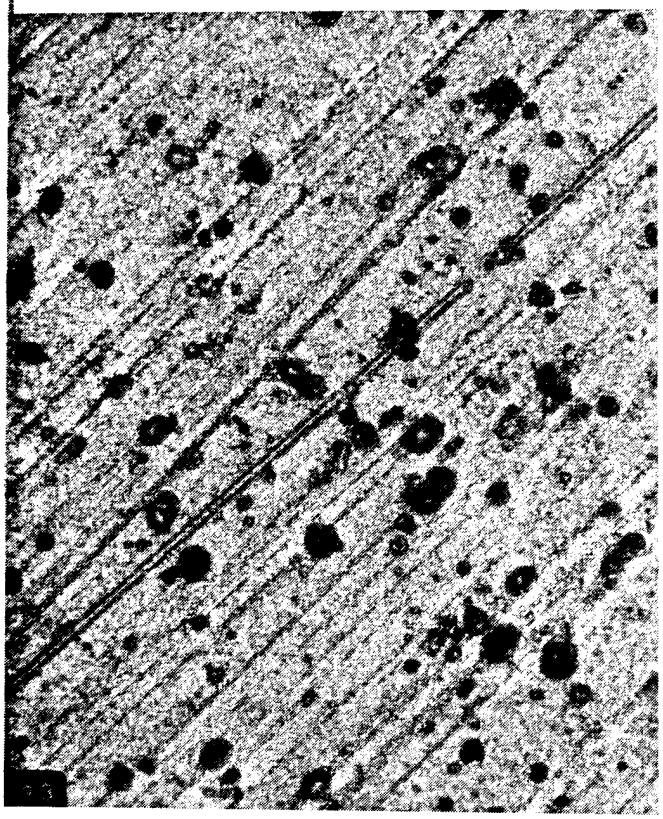


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

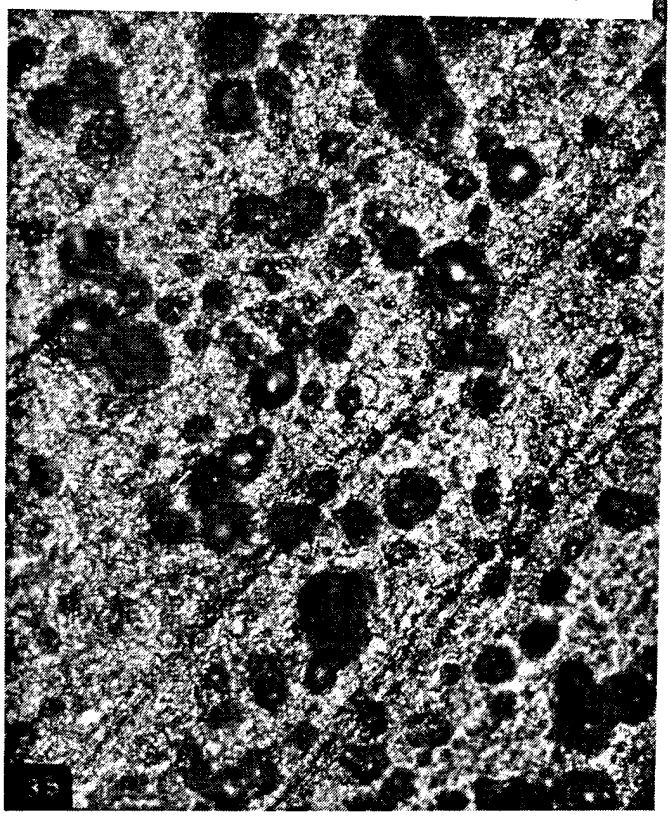
AA2017, 25, 16-hour Soak, Versa Clean, 1.6%, 120F



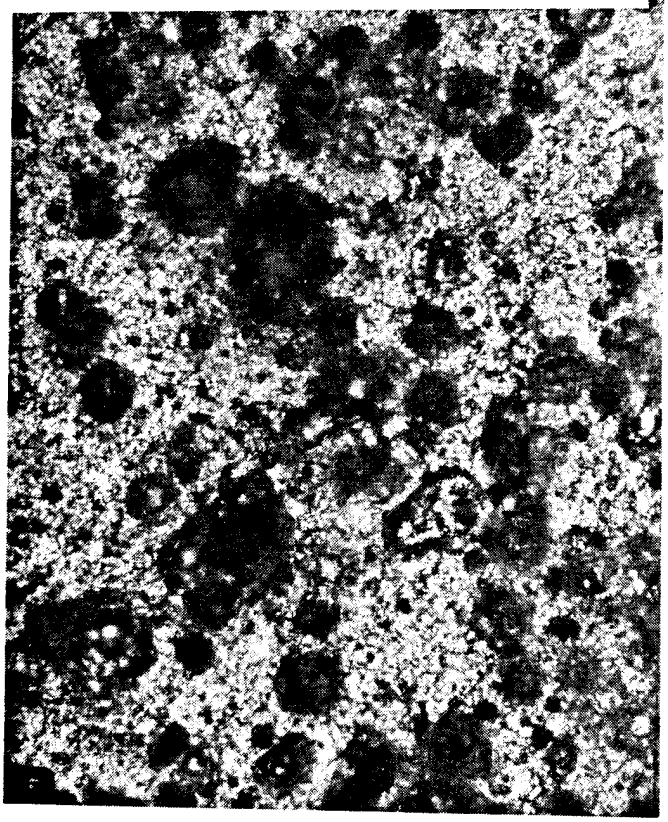
AA2017, 107, 16-hour Soak, Versa Clean, 3.2%, 120F



AA2017, 110, 16-hour Soak, Versa Clean, 6.3%, 120F

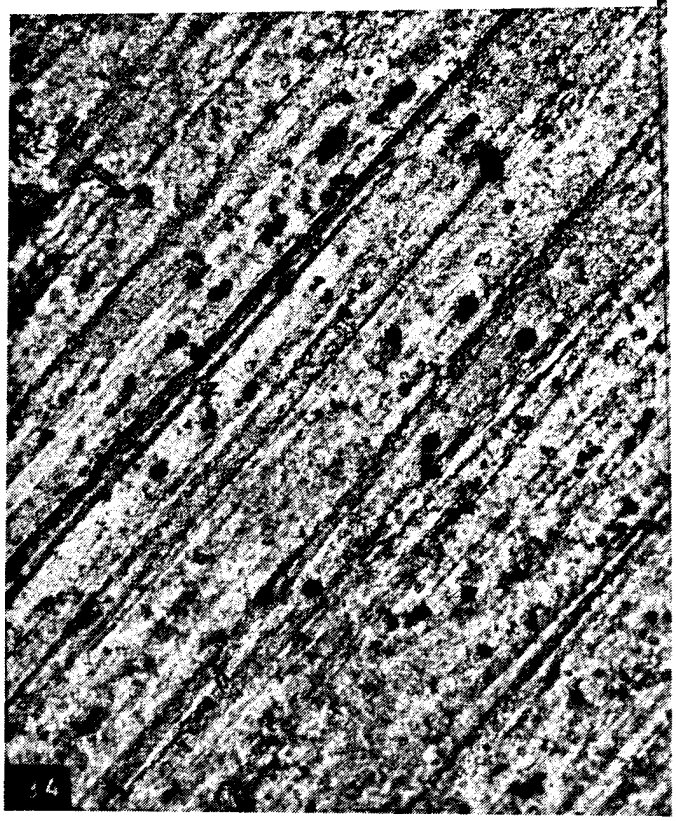


AA2017, 113, 16-hour Soak, Versa Clean, 9.1%, 120F



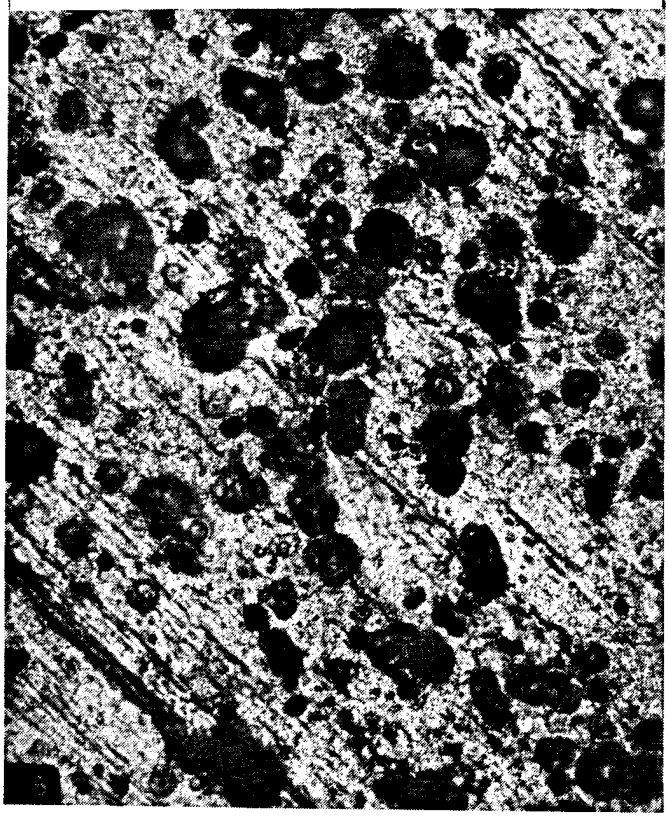
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

AA2017, 116, 16-hour Soak, Versa Clean, 1.6%, 155F

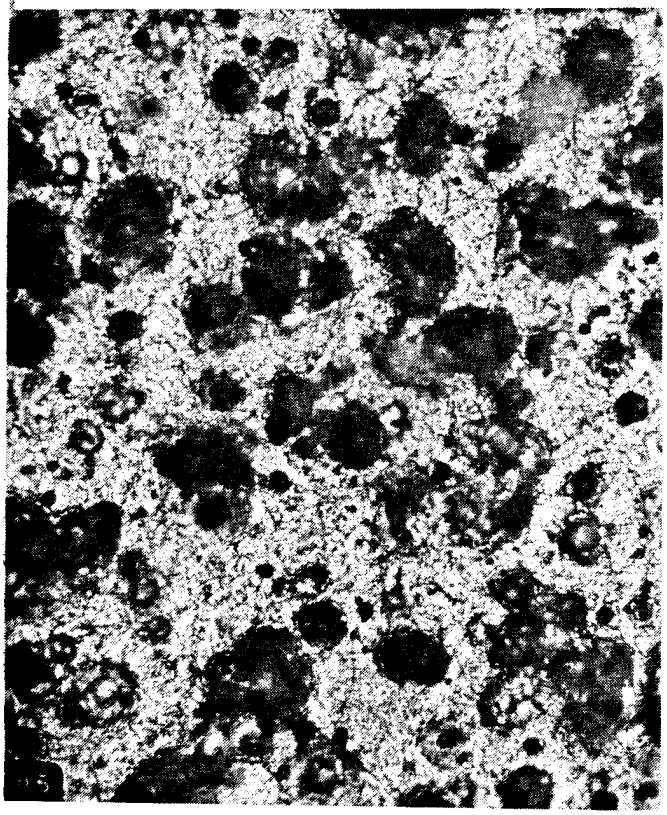


AA2017, 119, 16-hour Soak, Versa Clean, 3.2%, 155F

AA2017, 122, 16-hour Soak, Versa Clean, 6.3%, 155F



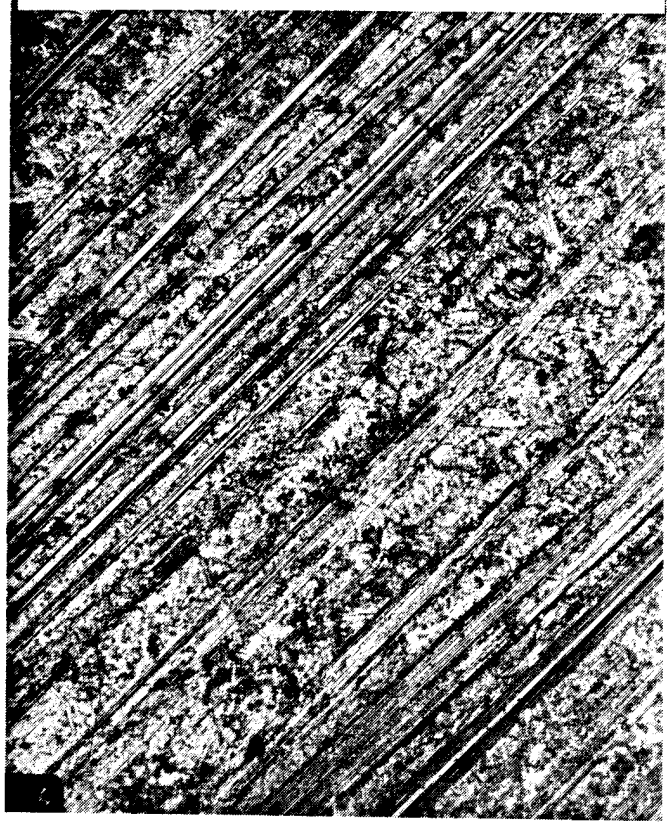
AA2017, 10, 16-hour Soak, Versa Clean, 9.1%, 155F



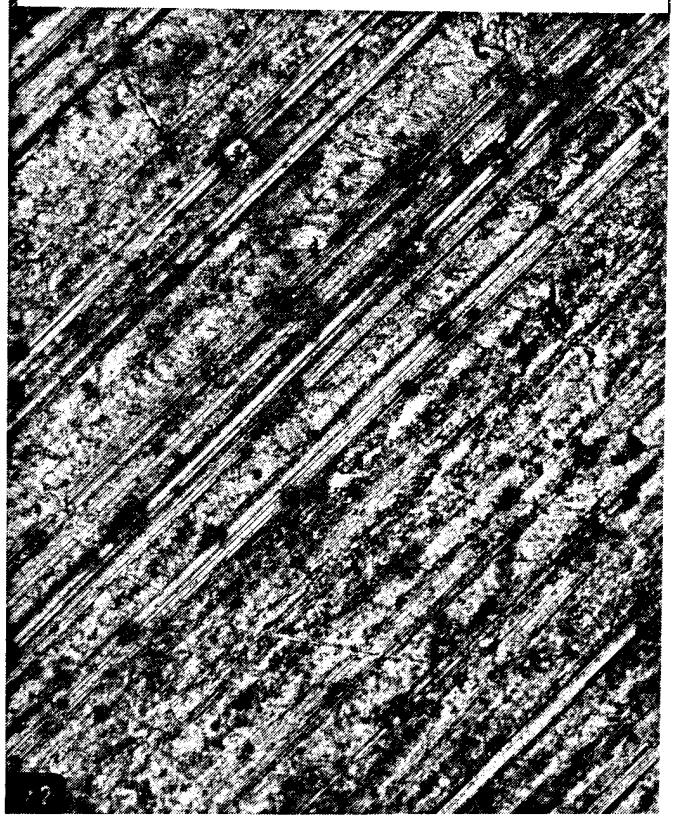
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

AA2017, 128, Sonication, Versa Clean, 1.6%, 120F

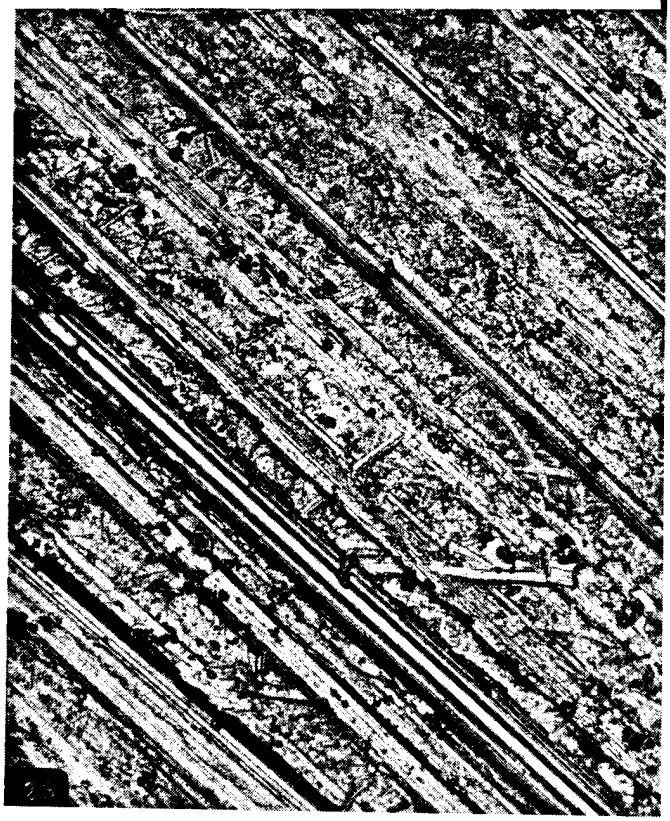
AA2017, 134, Sonication, Versa Clean, 3.2%, 120F



AA2017, 140, Sonication, Versa Clean, 6.3%, 120F

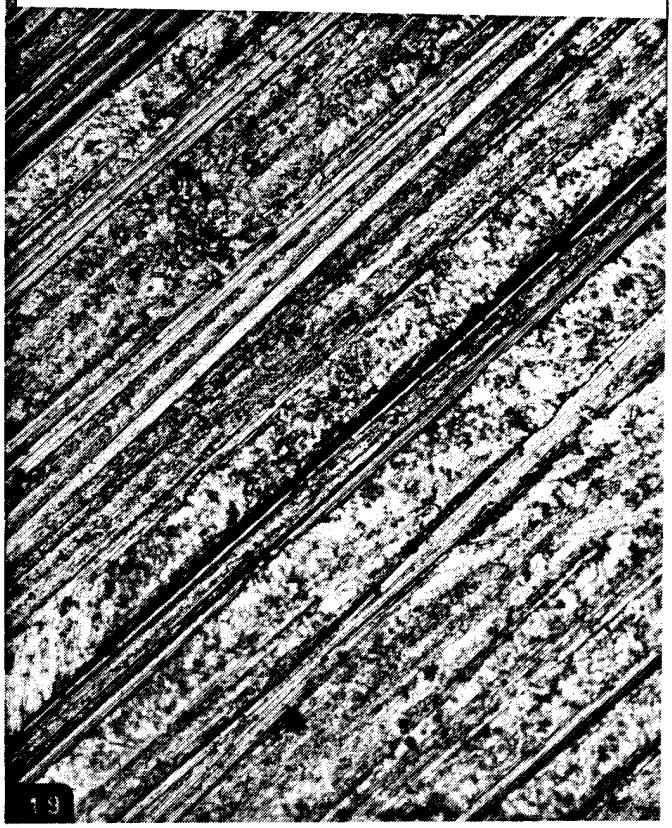


AA2017, 146, Sonication, Versa Clean, 9.1%, 120F



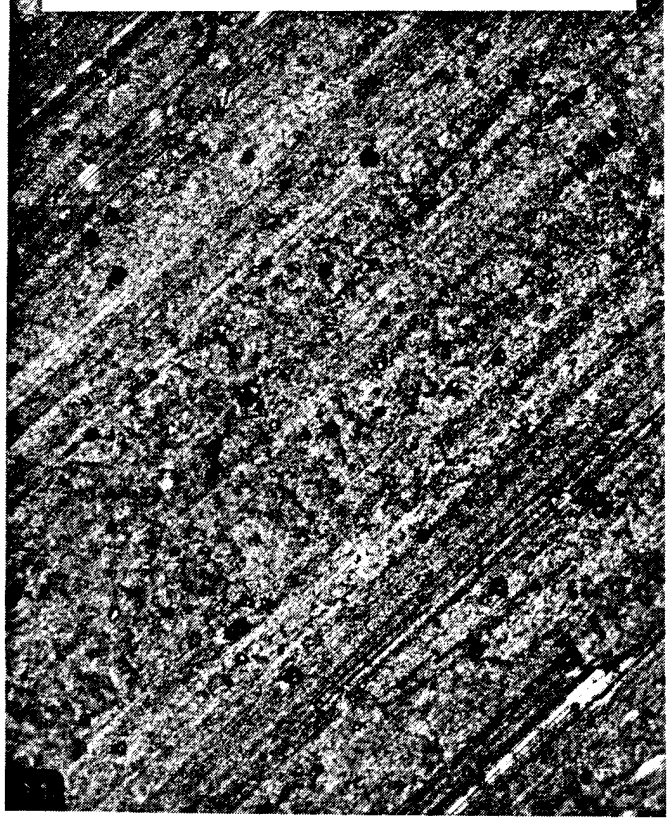
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

AA2017, 131, Sonication, Versa Clean, 1.6%, 155F



AA2017, 137, Sonication, Versa Clean, 3.2%, 155F

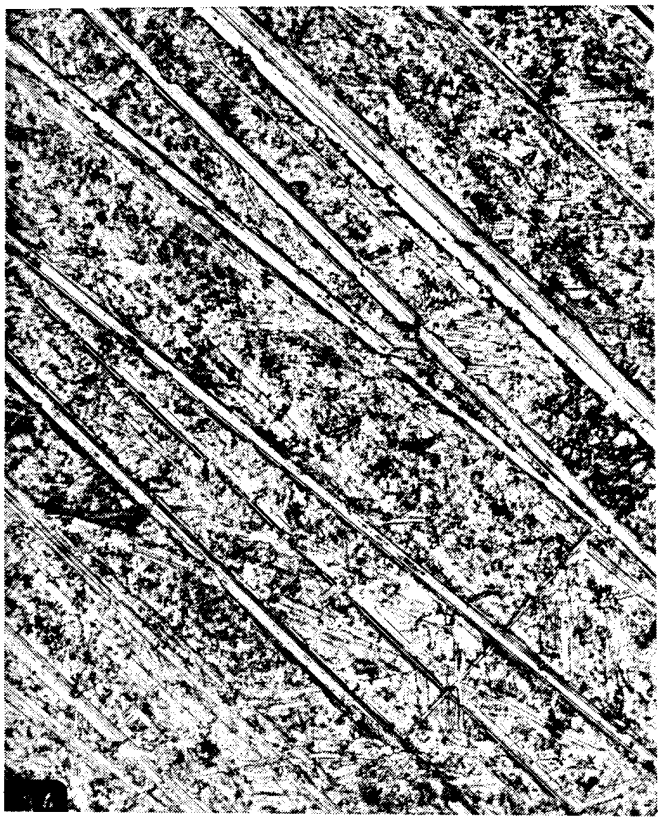
AA2017, 143, Sonication, Versa Clean, 6.3%, 155F



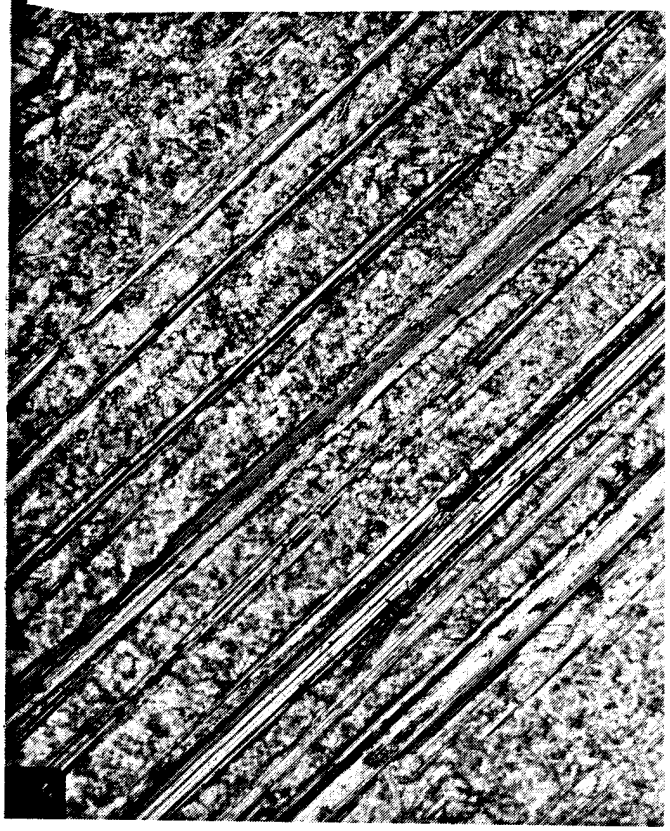
AA2017, 149, Sonication, Versa Clean, 9.1%, 155F

Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

AA2017, 270, 1-hr soak, Intex 8125, 20%, 120F



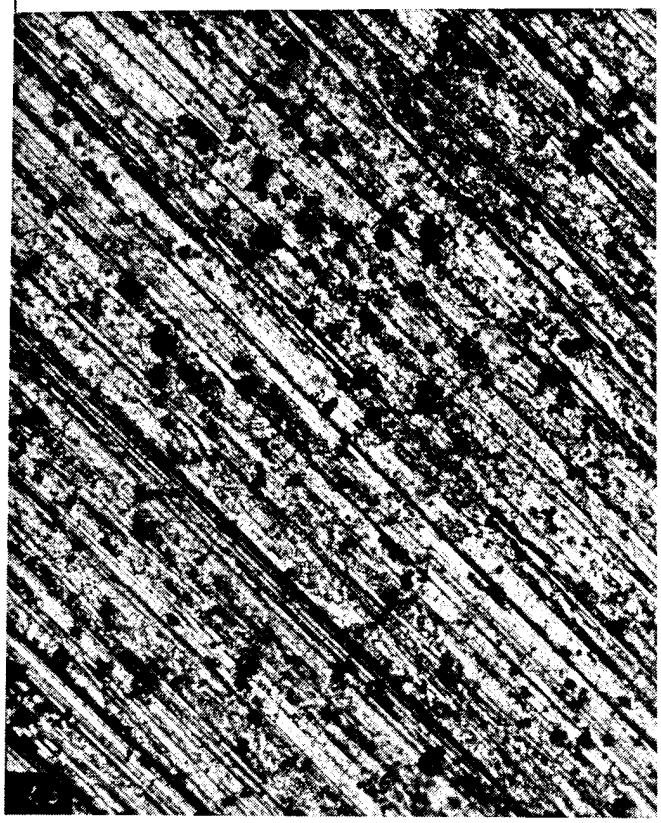
AA2017, 39, 16-hour Soak, CFC-113, 100%, 115F



AA2017, 78, Sonication, CFC-113, 100%, 115F

Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

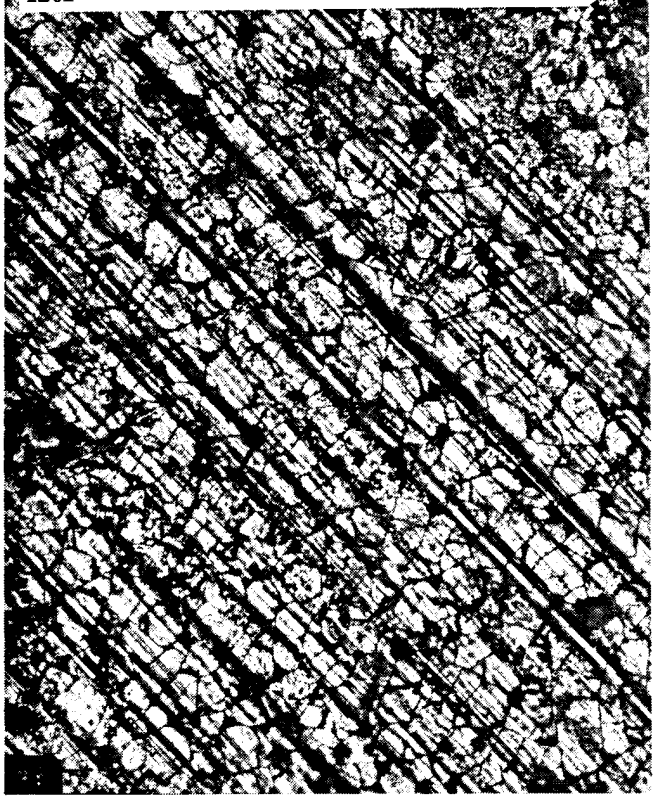
Anod. 2017, 222, 16-hour Soak, DI H_2O, 100%, 120F



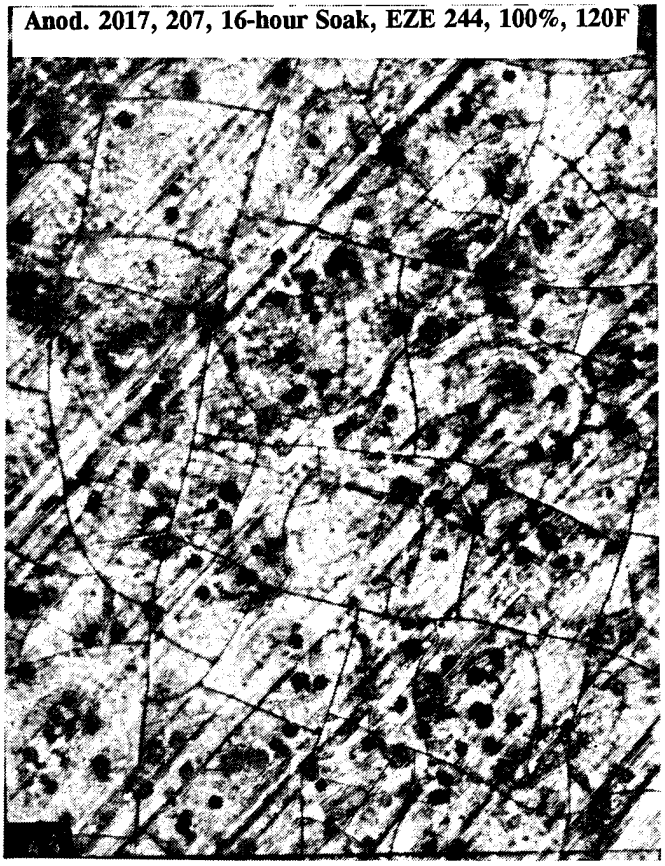
Anod. 2017, 201, 16-hour Soak, Versa Clean, 2%, 120F

Anod. 2017, 228, 16-hour Soak, Versa Clean, 6.3%, 155F

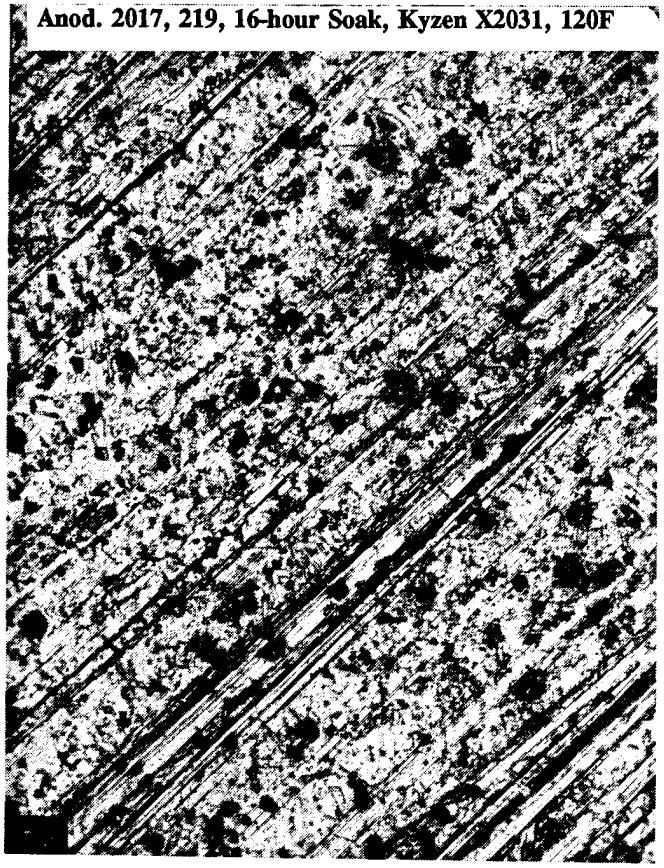
Anod. 2017, 210, 16-hour Soak, Brulin 815 GD, 4.8%, 120F

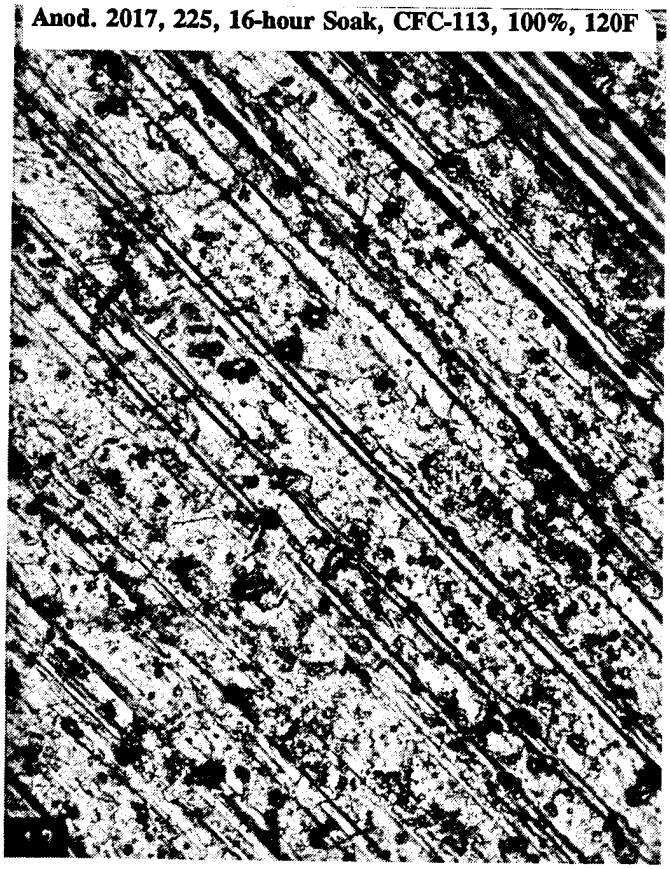


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

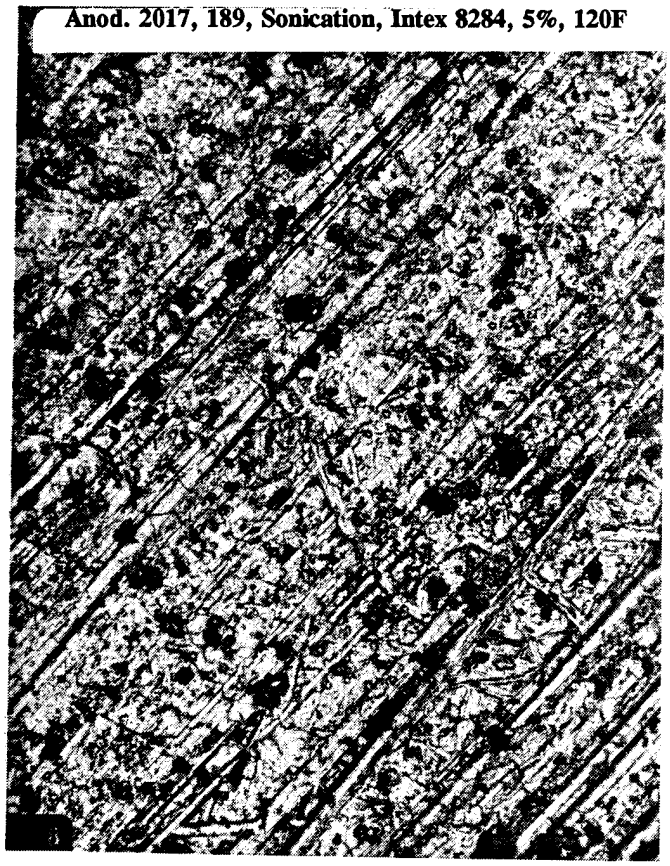


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



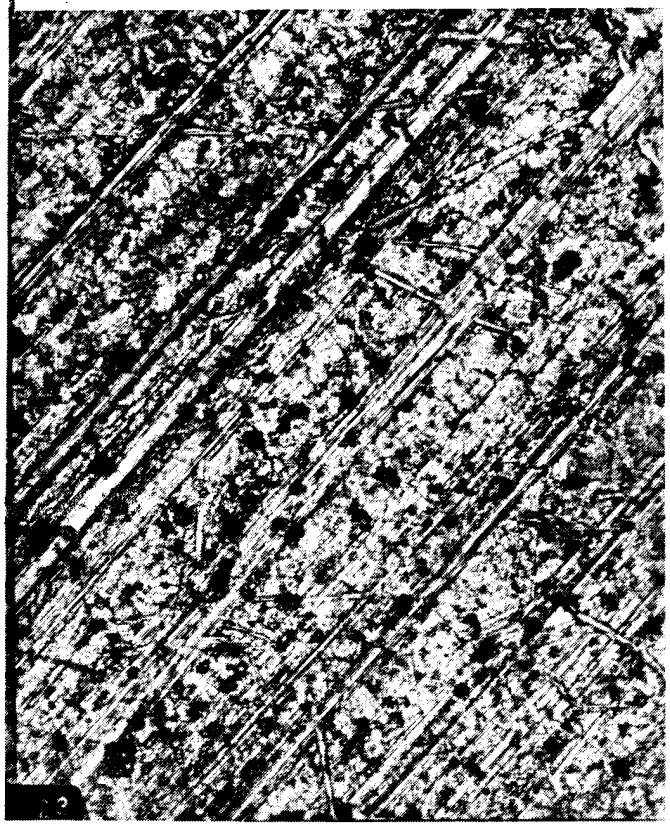


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

Anod. 2017, 165, Sonication, EZE 244, 100%, 120F



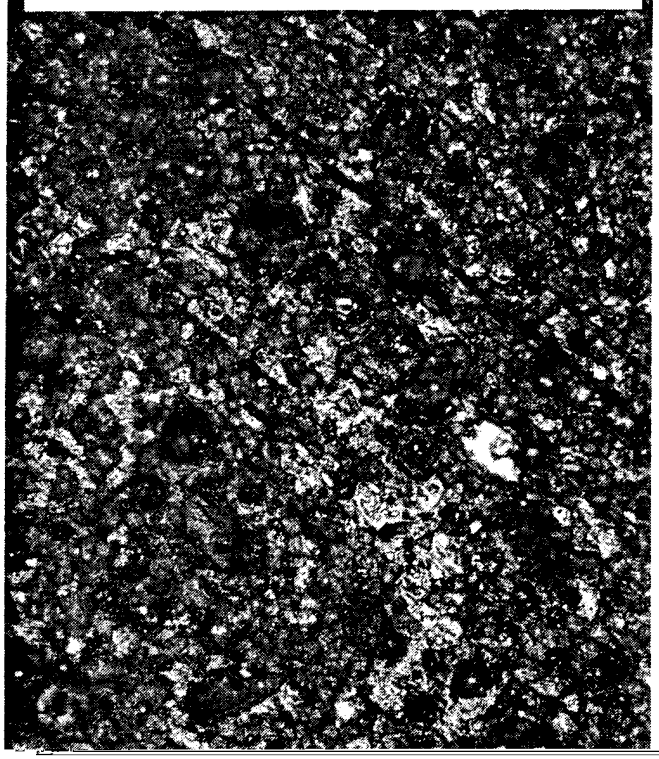
Anod. 2017, 162, Sonication, PF Degreaser, 100%, 120F

Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

AA6061, 02, Baseline

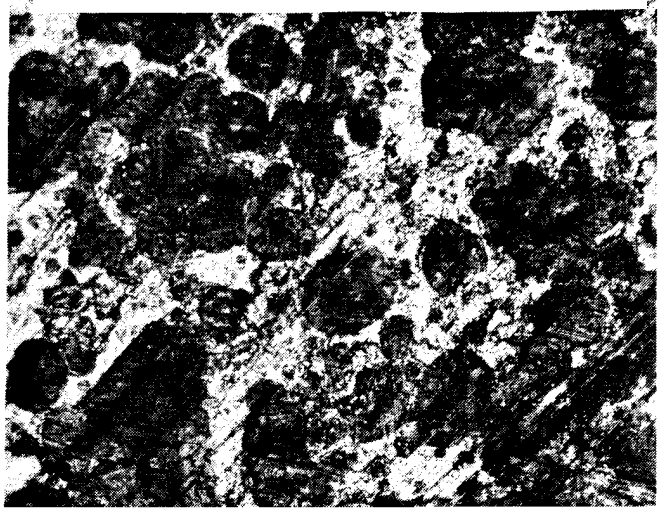
AA6061, 26, 16-hour Soak, DI H_2O, 100%, 120F

AA6061, 5, 16-hour Soak, Versa Clean, 6.3%, 120F

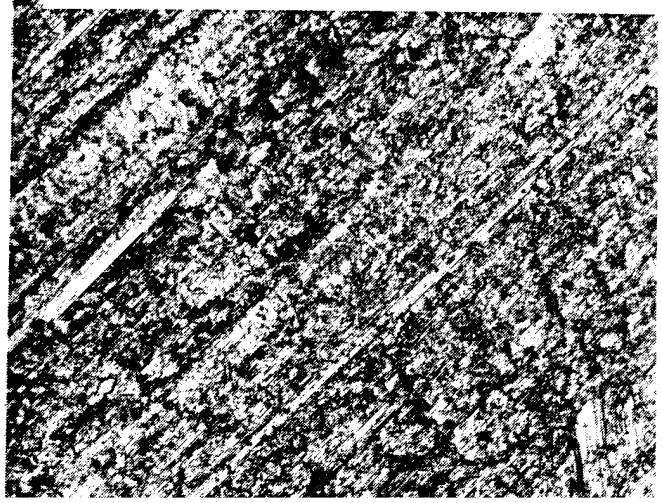


AA6061, 17, 16-hour Soak, Intex 8125, 20%, 120F

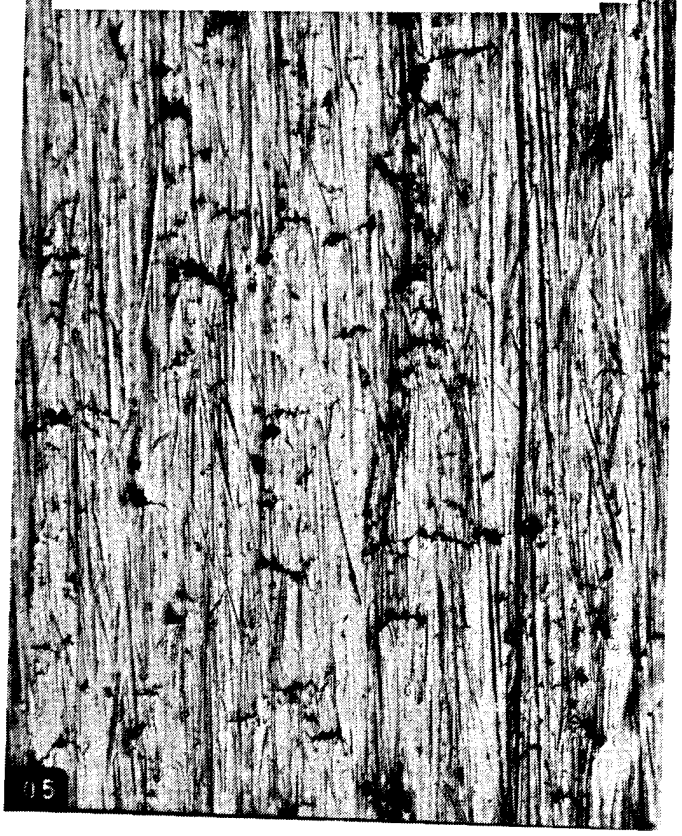
AA6061, 11, 16-hour Soak, EZE 244, 100%, 120F



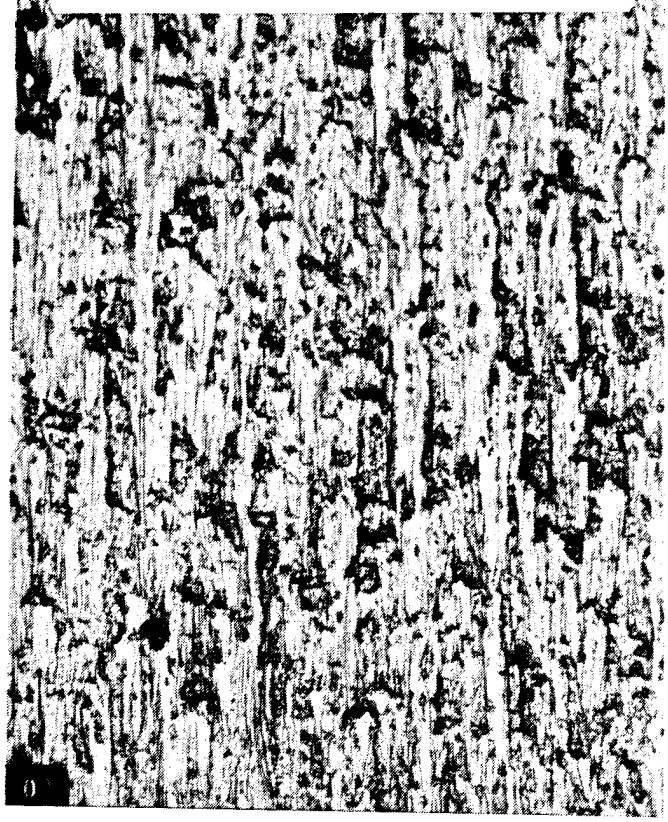
AA6061, 20, 16-hour Soak, Intex 8284, 15%, 120F



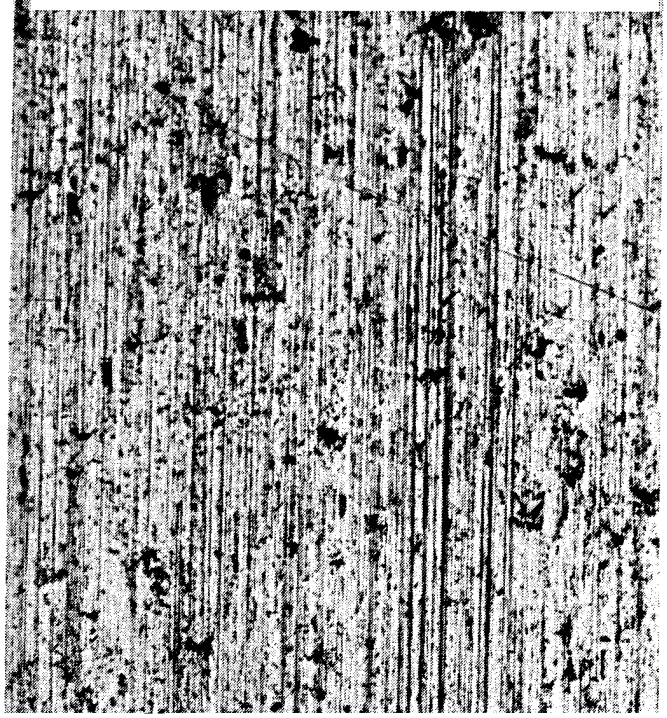
Beryllium, 57A, Baseline



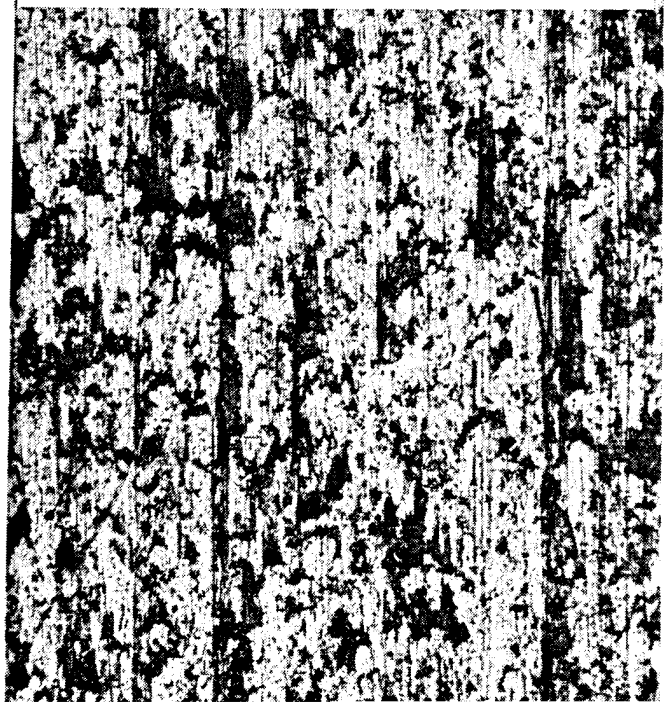
Beryllium, 28A, 16-hour Soak, Brulin 815 GD, 9.1%, 155F



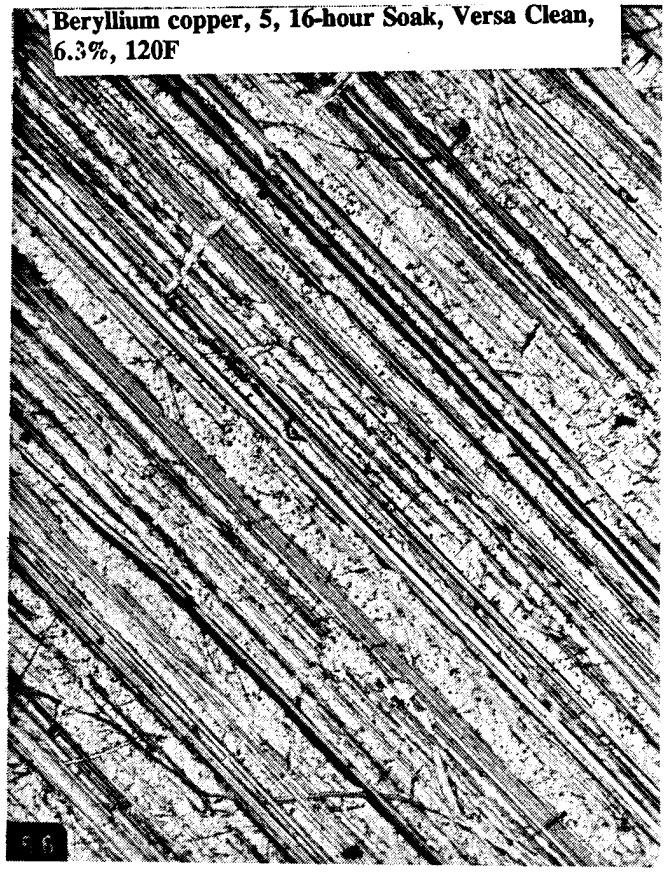
Beryllium, 22A, 16-hour Soak, Intex 8284, 5%, 120F

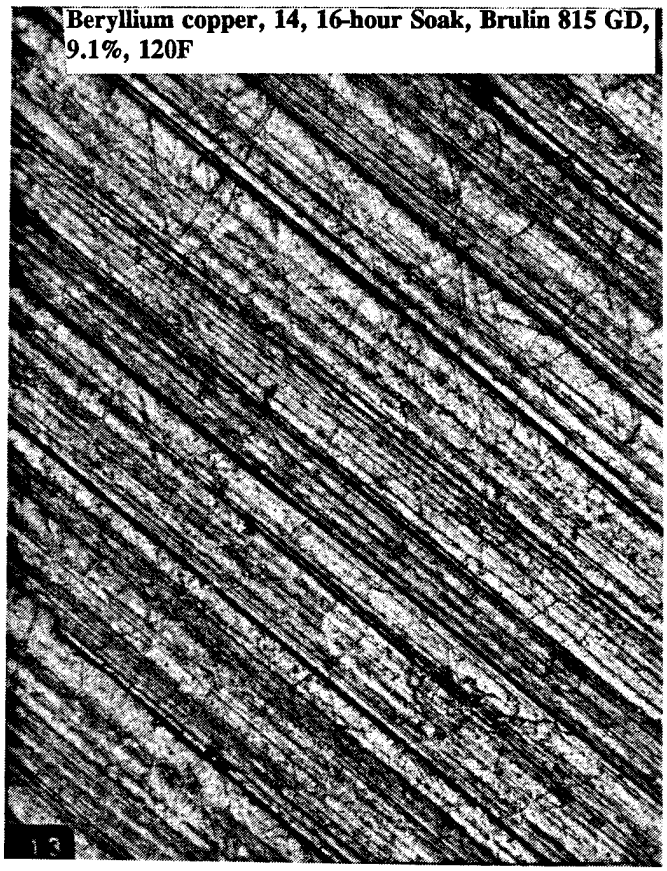


Beryllium, 30A, 16-hour Soak, Intex 8284, 15%, 155F

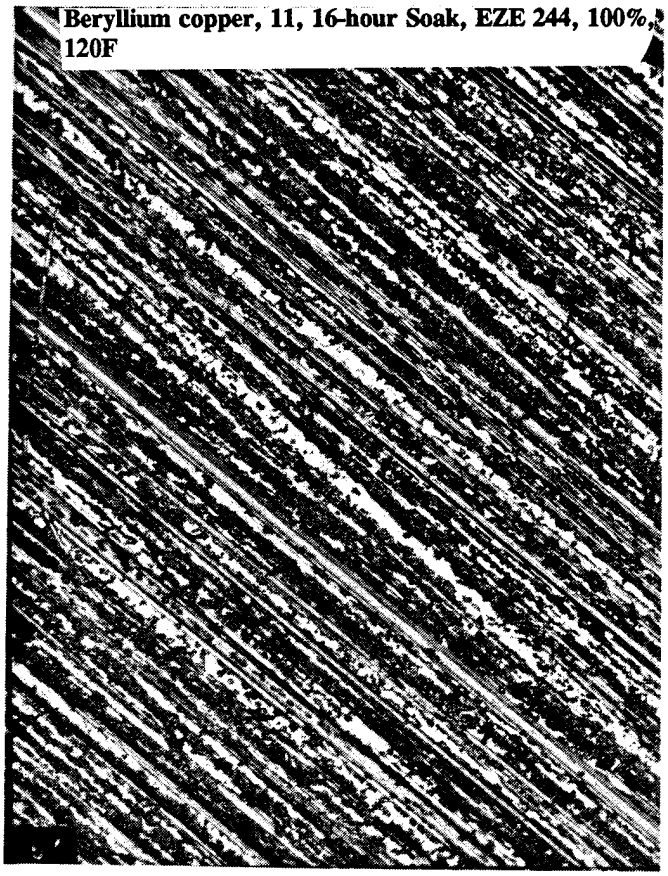


Beryllium, 14A, Sonication, Intex 8284, 5%, 155F

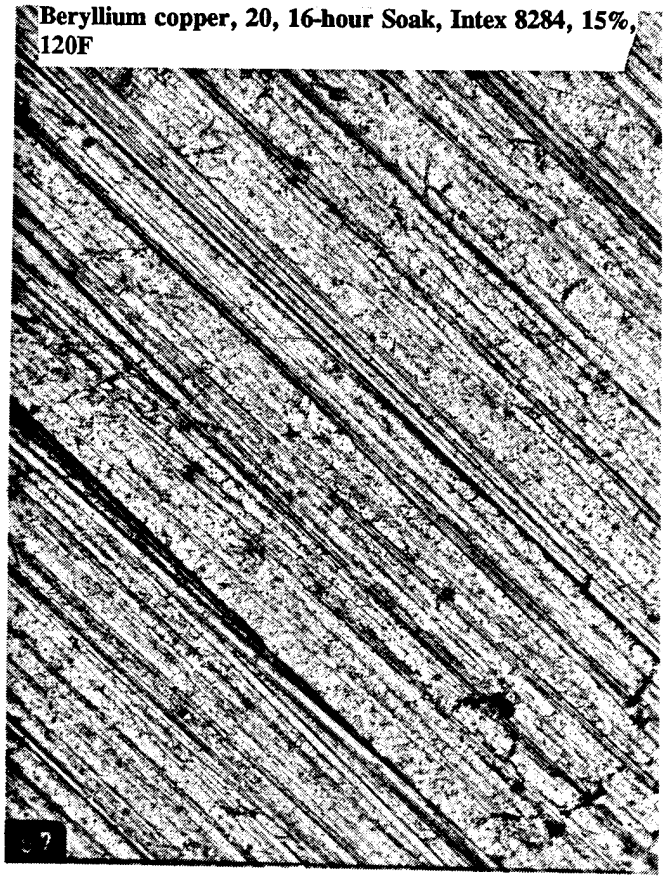




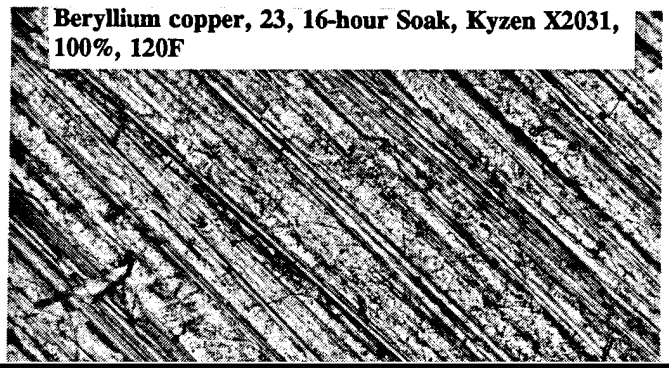
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



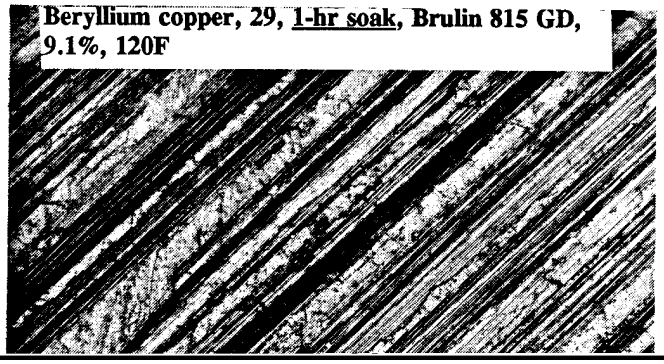
Beryllium copper, 11, 16-hour Soak, EZE 244, 100%, 120F



Beryllium copper, 20, 16-hour Soak, Intex 8284, 15%, 120F



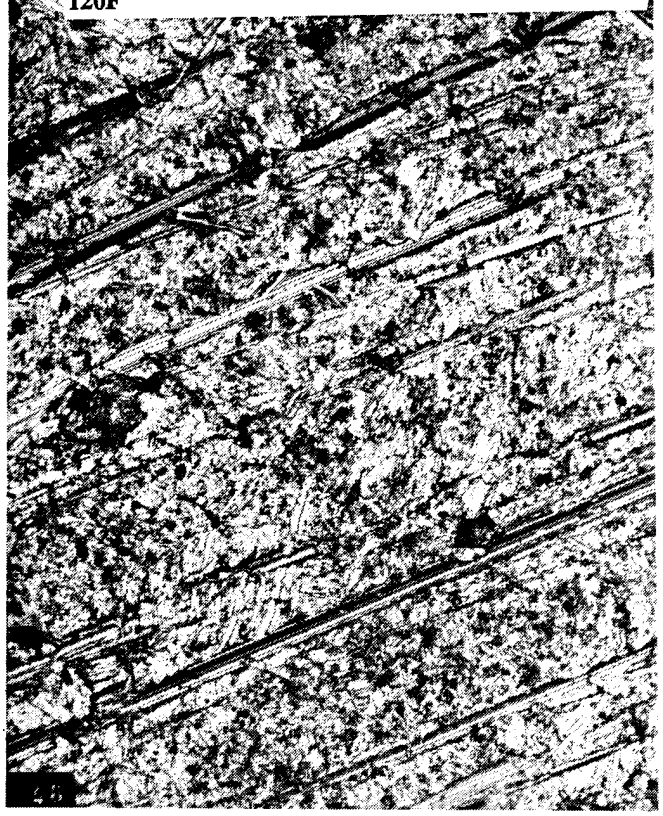
Beryllium copper, 23, 16-hour Soak, Kyzen X2031, 100%, 120F



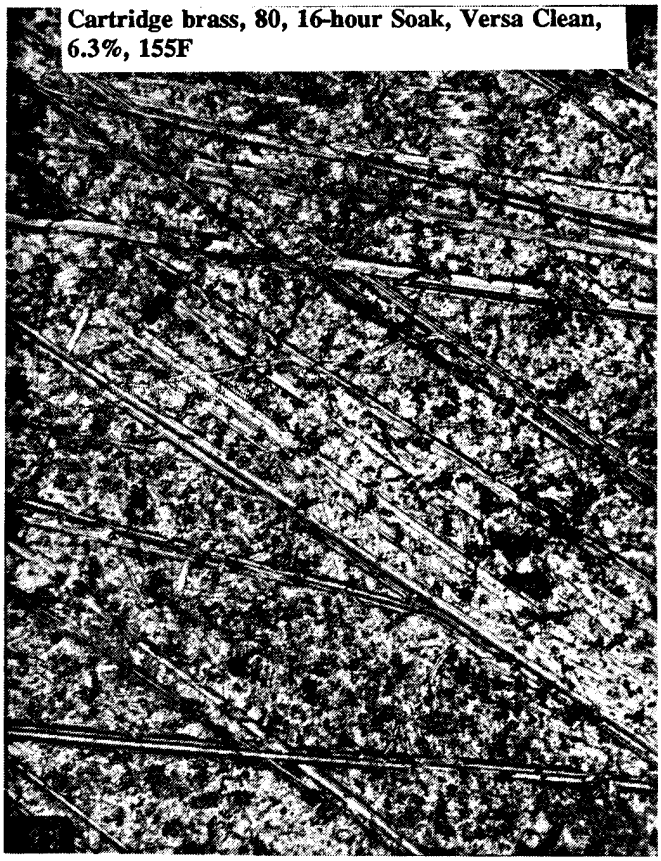
Beryllium copper, 29, 1-hr soak, Brulin 815 GD, 9.1%, 120F

Cartridge brass, 02, Baseline

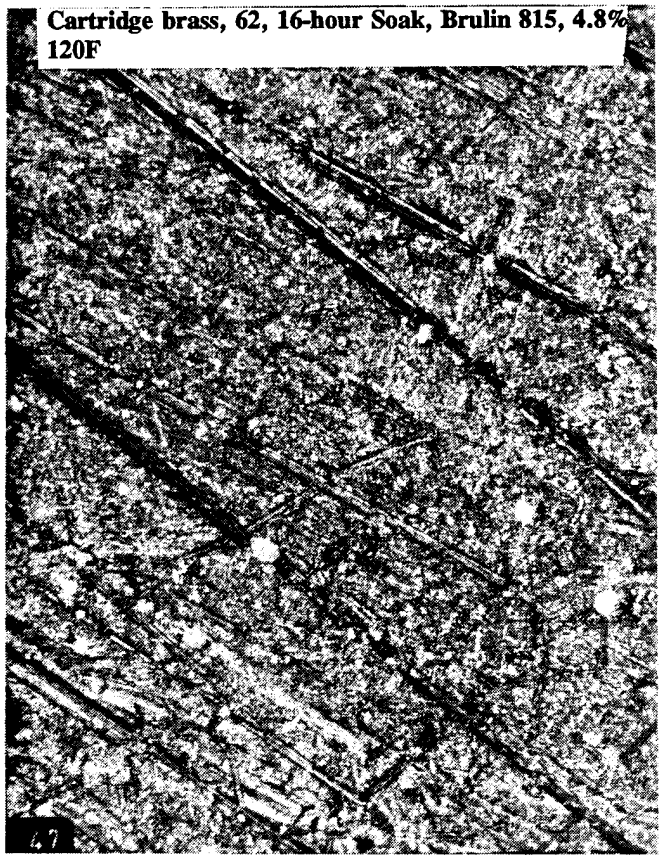
Cartridge brass, 53, 16-hour Soak, Versa Clean, 2%, 120F



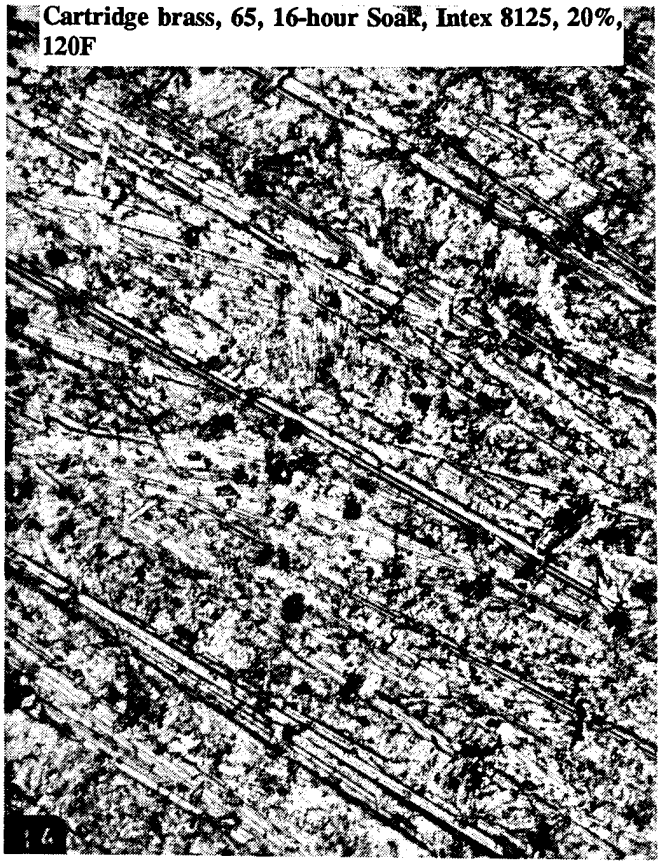
Cartridge brass, 80, 16-hour Soak, Versa Clean, 6.3%, 155F

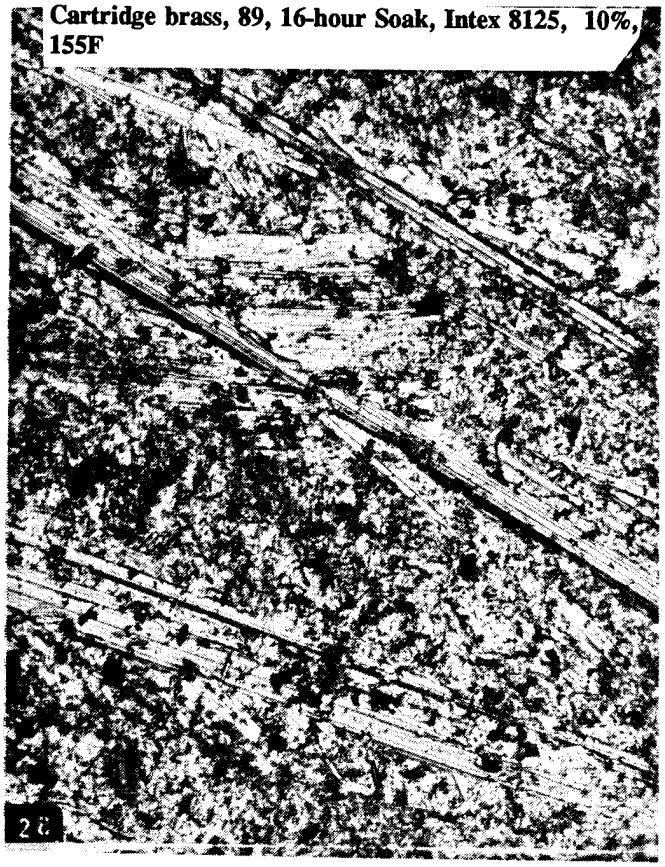


Cartridge brass, 62, 16-hour Soak, Brulin 815, 4.8% 120F

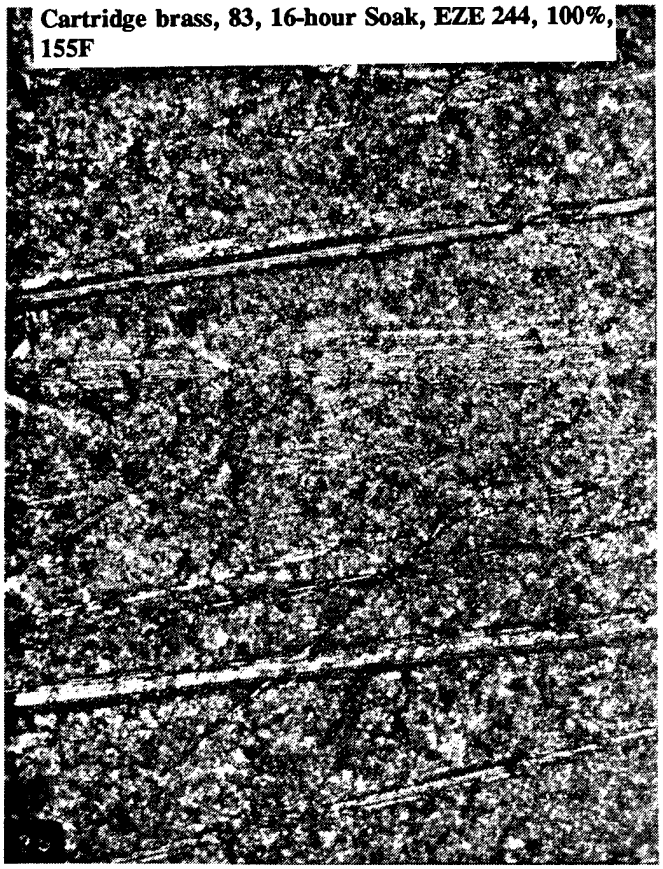


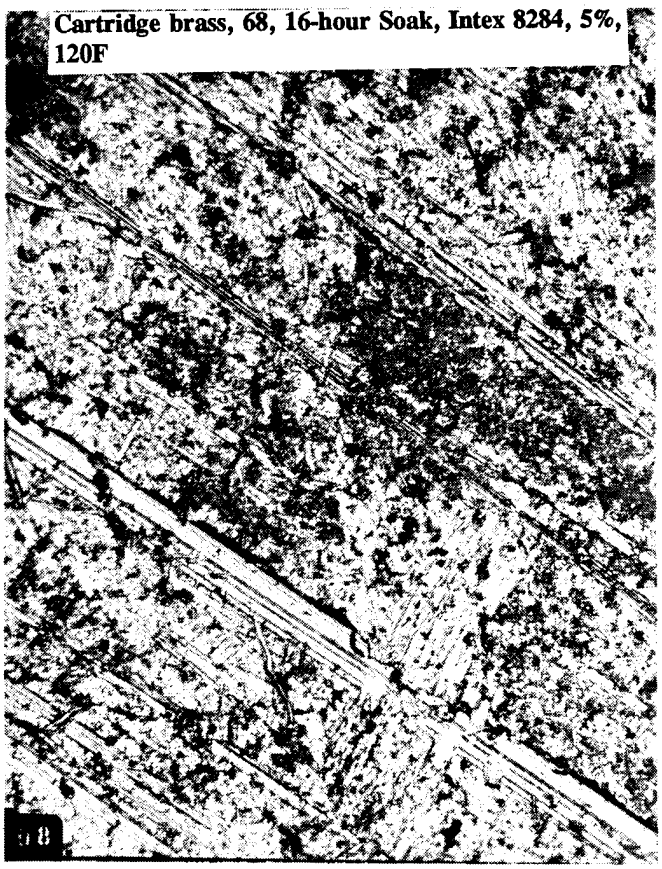
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.





Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

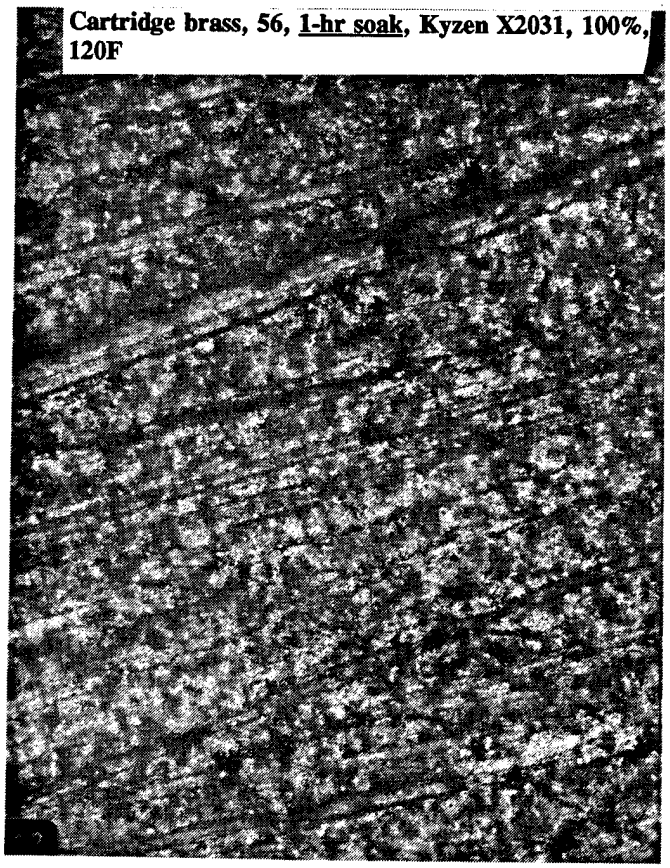




Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

Cartridge brass, 92, 16-hour Soak, Intex 8284, 15%, 155F

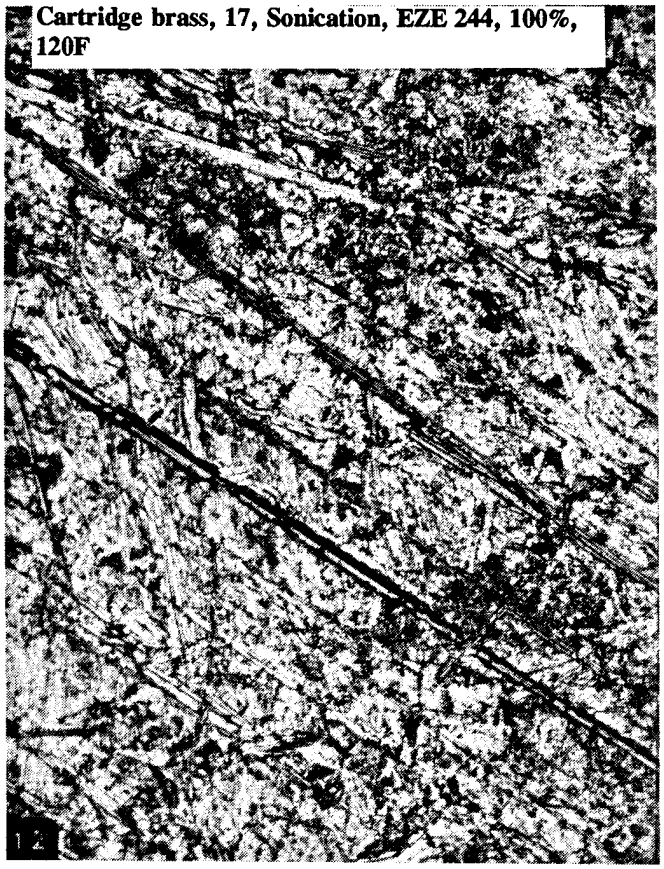
Cartridge brass, 72, 16-hour Soak, Kyzen X2031, 100%, 120F



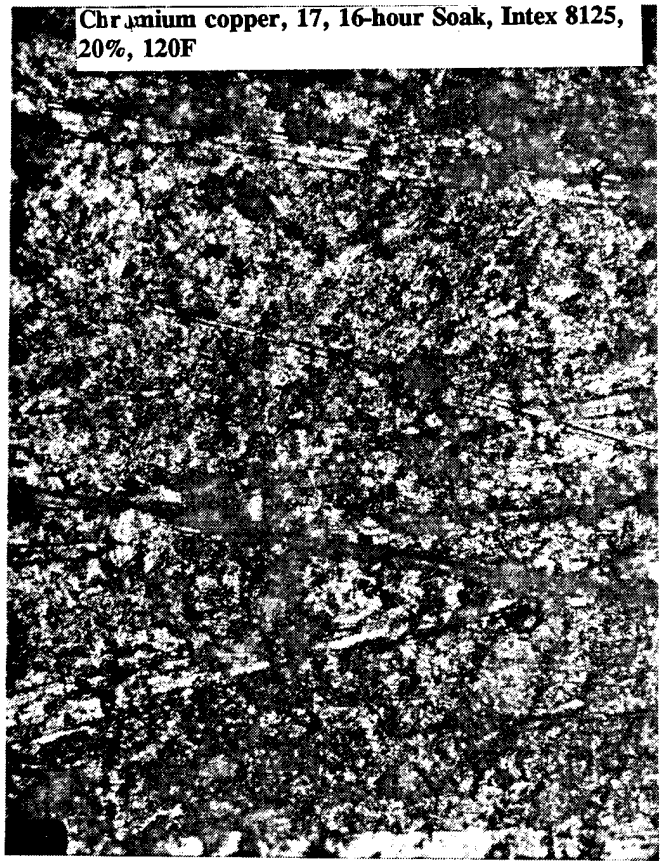
Cartridge brass, 56, <u>1-hr soak</u>, Kyzen X2031, 100%, 120F

Cartridge brass, 77, 16-hour Soak, CFC-113, 100%, 120F

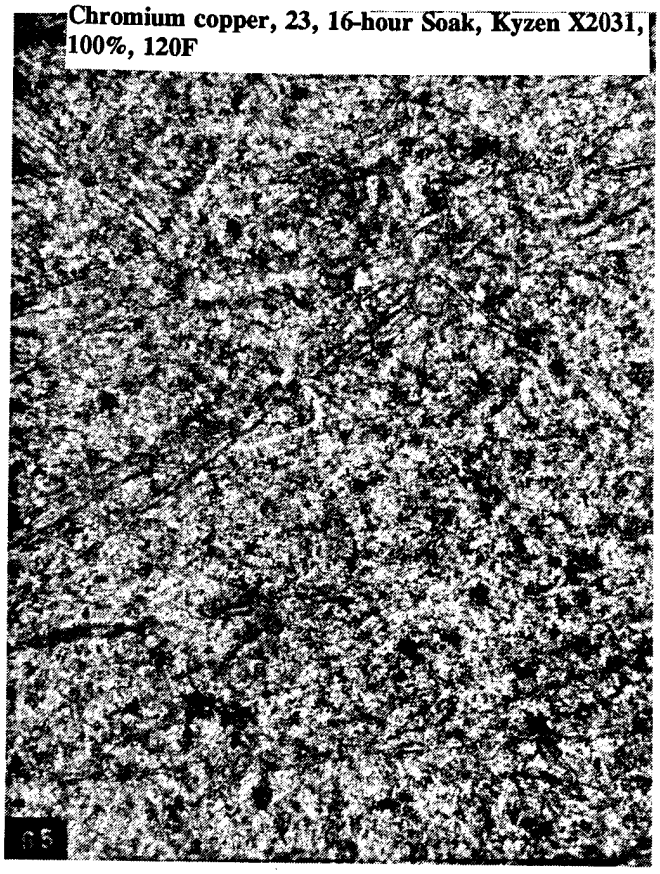
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



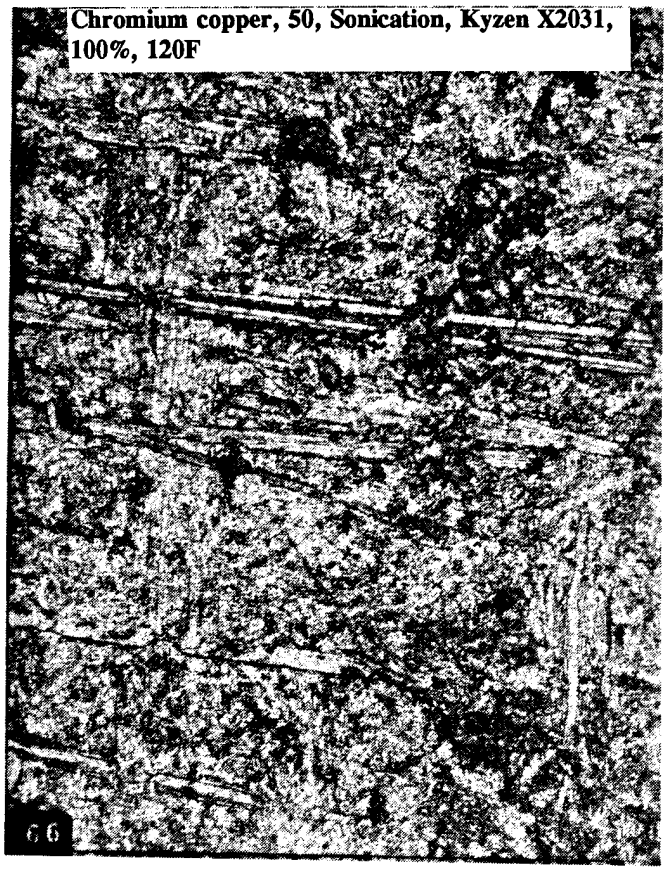
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



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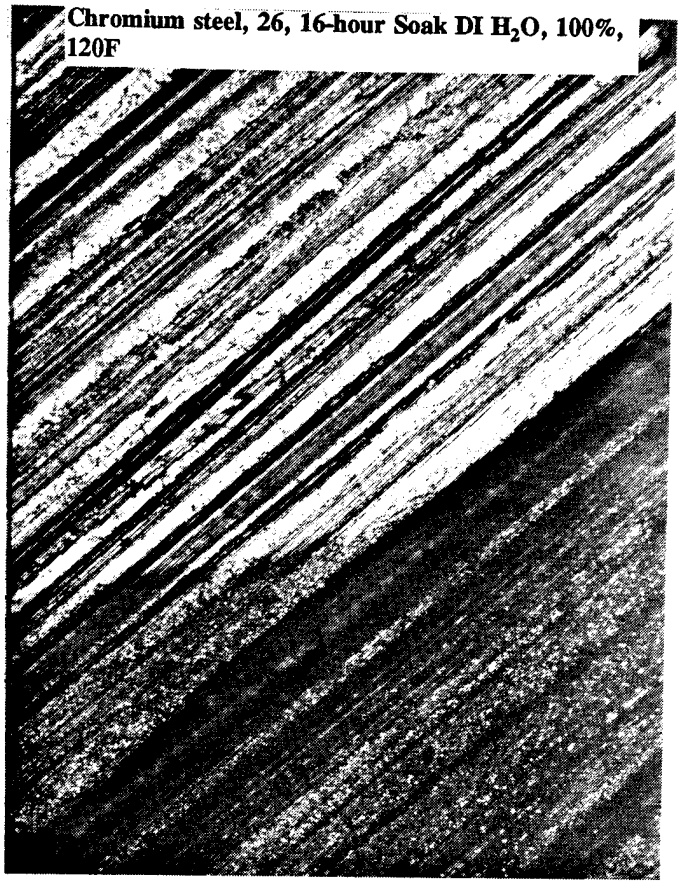
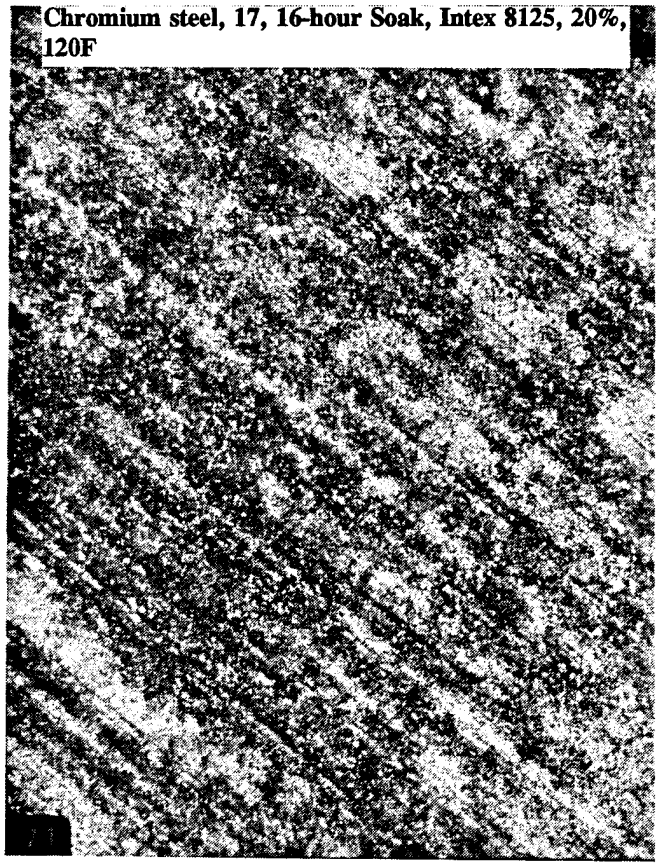
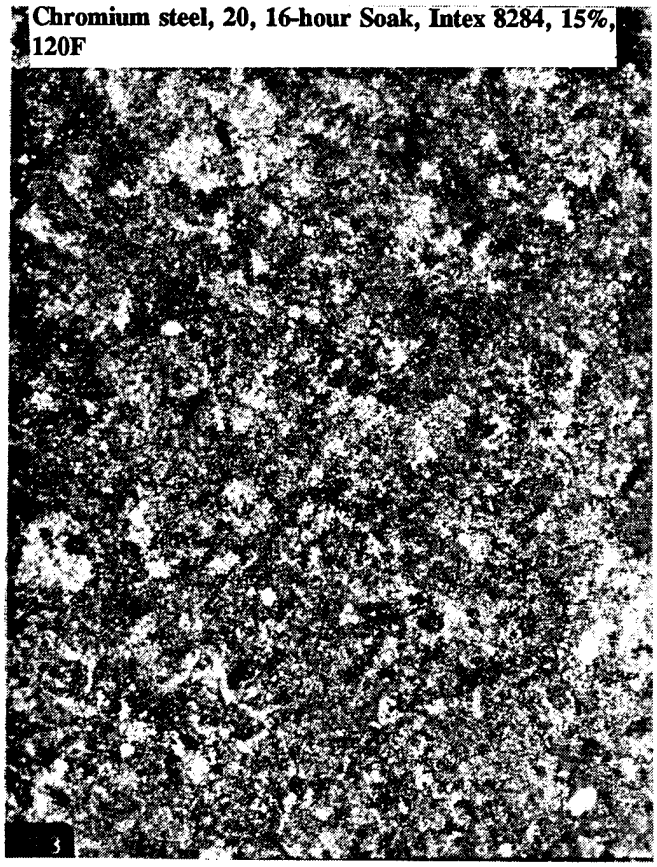
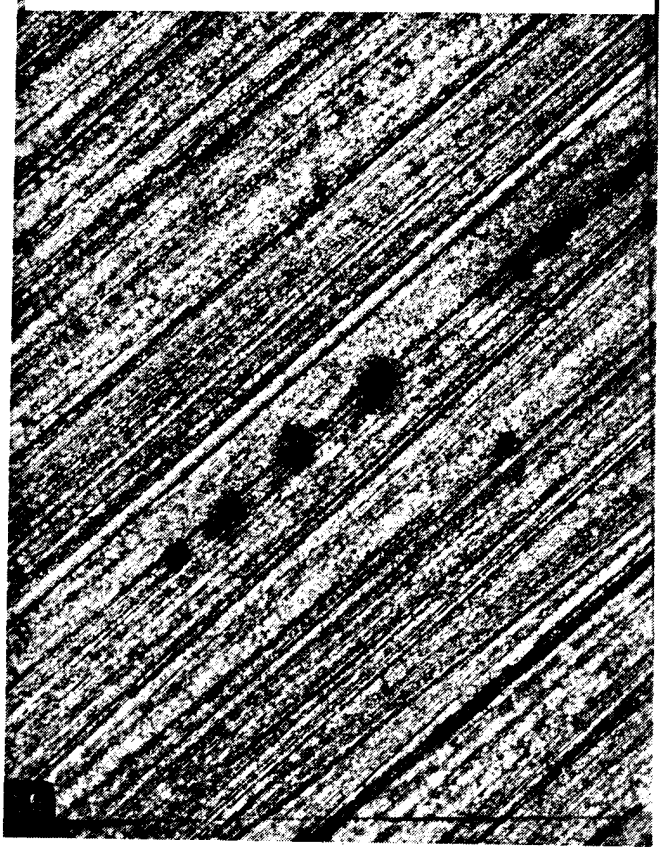




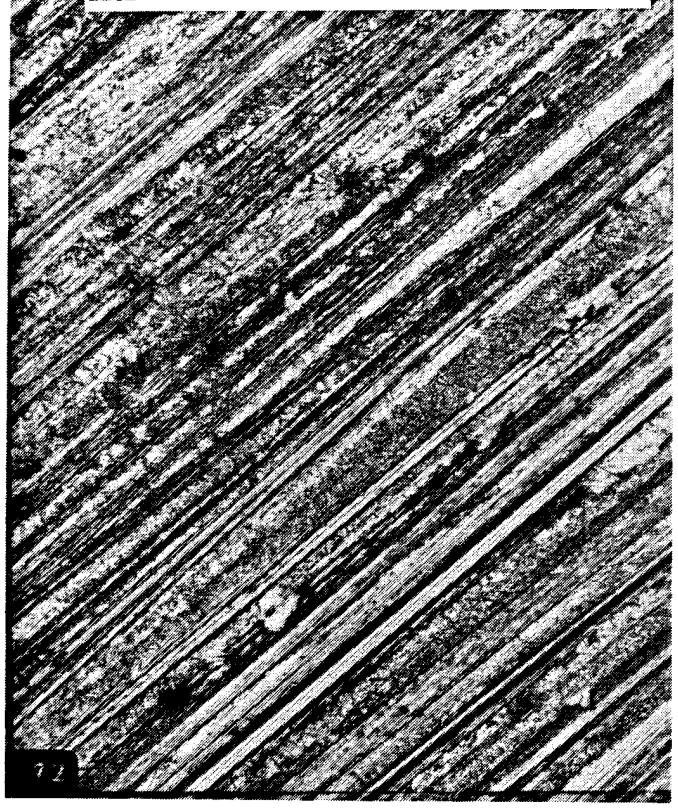


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

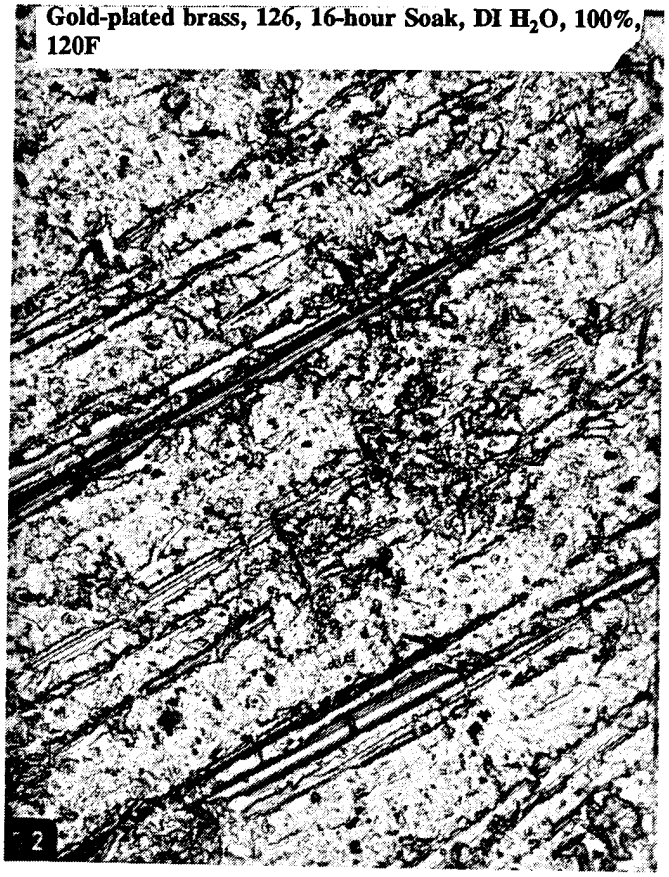
Chromium steel, 59, 1-hr soak, Intex 8125, 20%, 120F



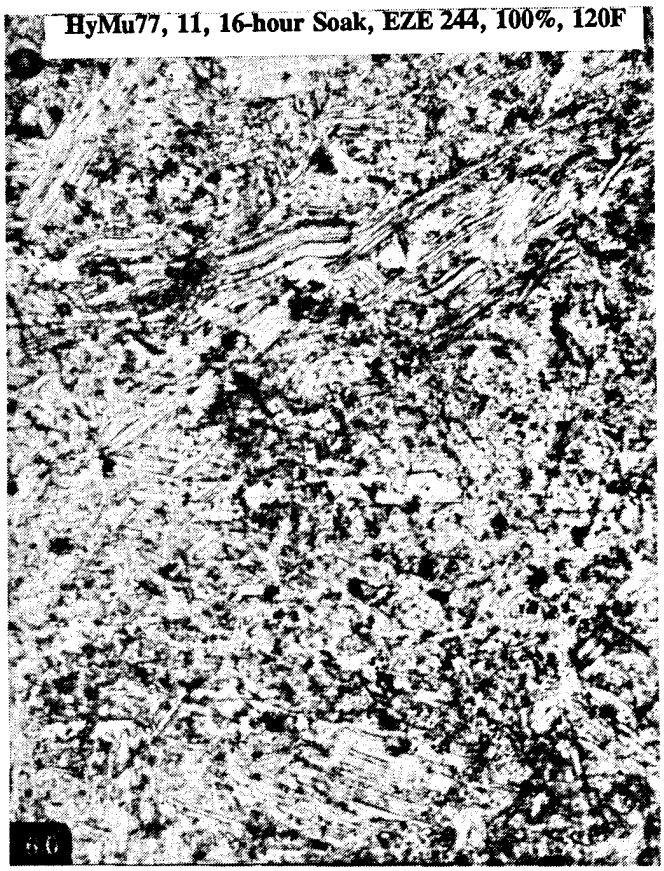
Chromium steel, 47, Sonication, Intex 8284, 15%, 120F



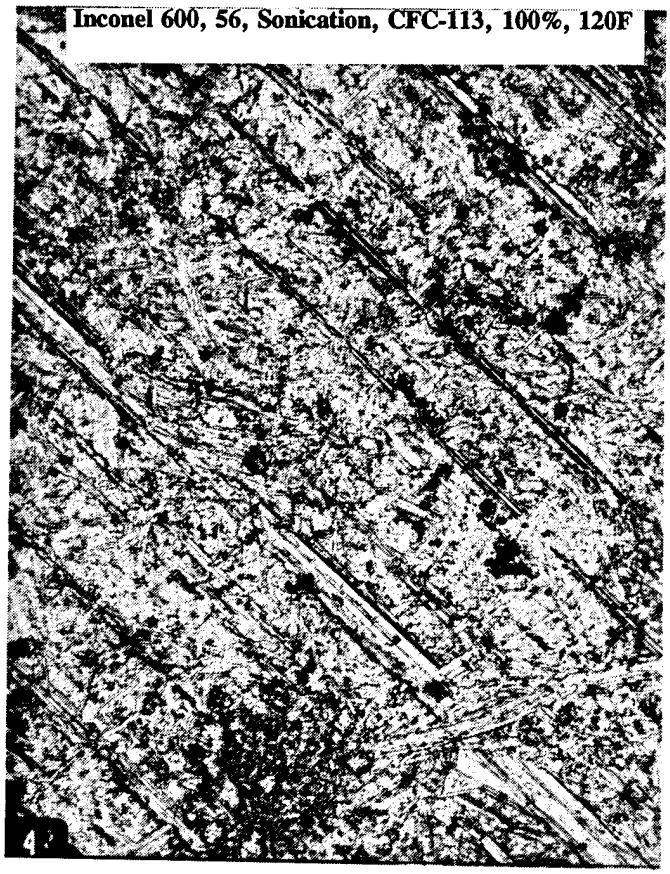
Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

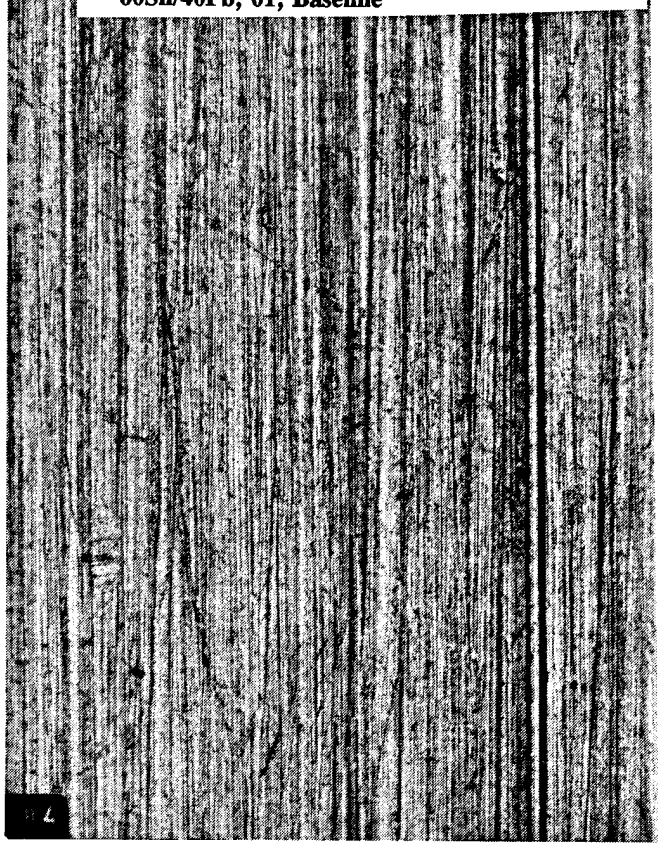


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

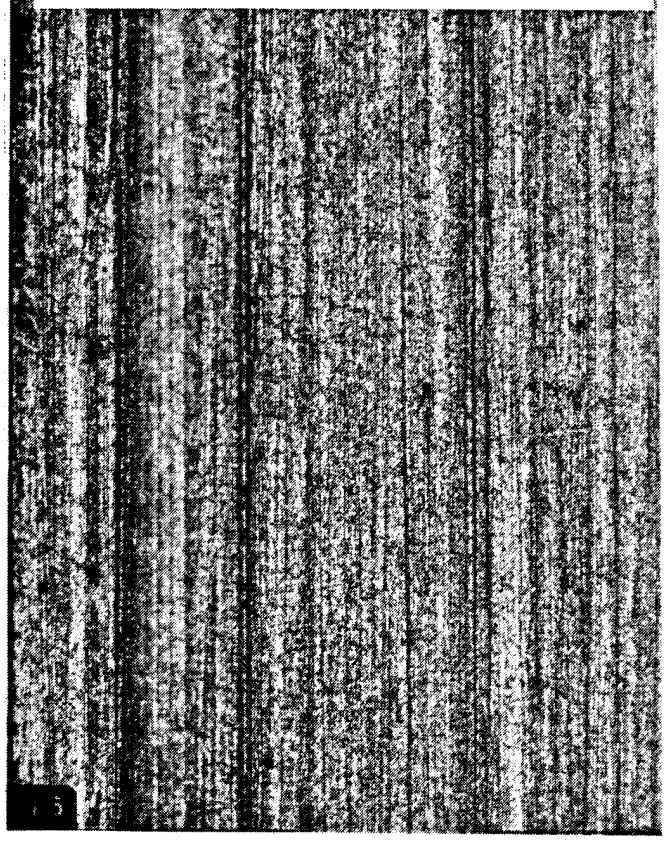


Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

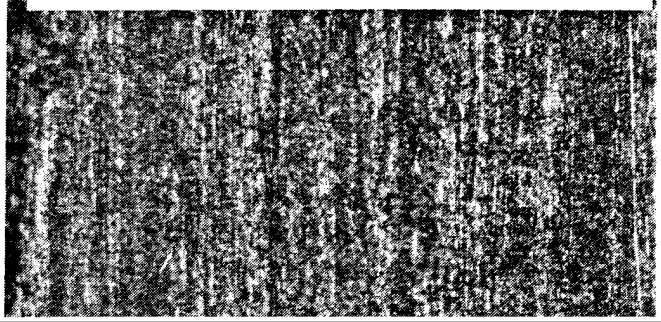
60Sn/40Pb, 01, Baseline



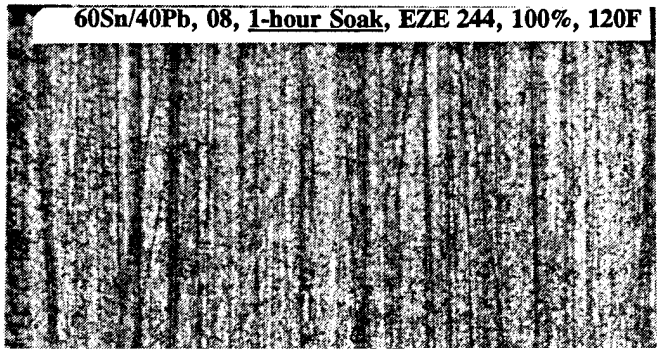
60Sn/40Pb, 03, 1-hour Soak, Versa Clean, 6.3%, 120F



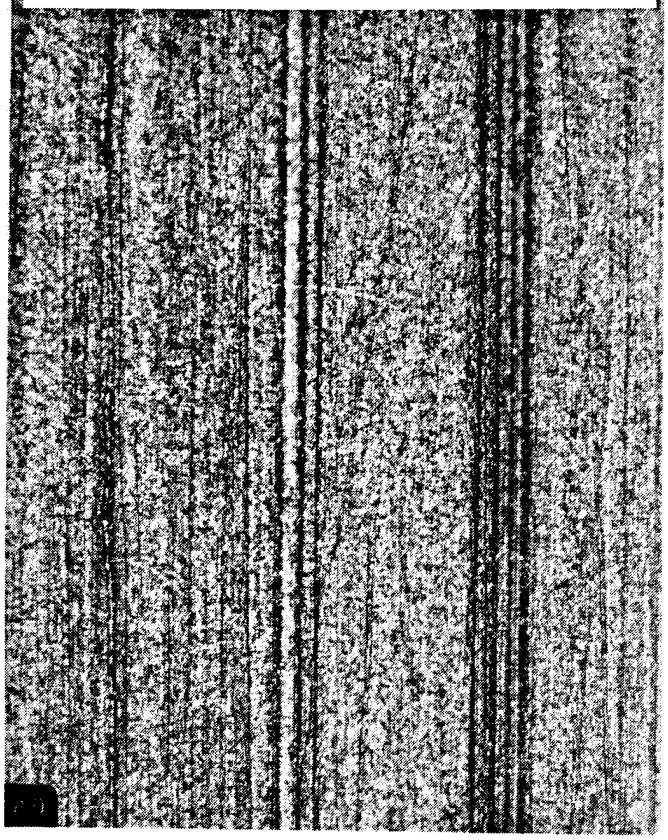
60Sn/40Pb, 11, 1-hour Soak, Intex 8125, 20%, 120F



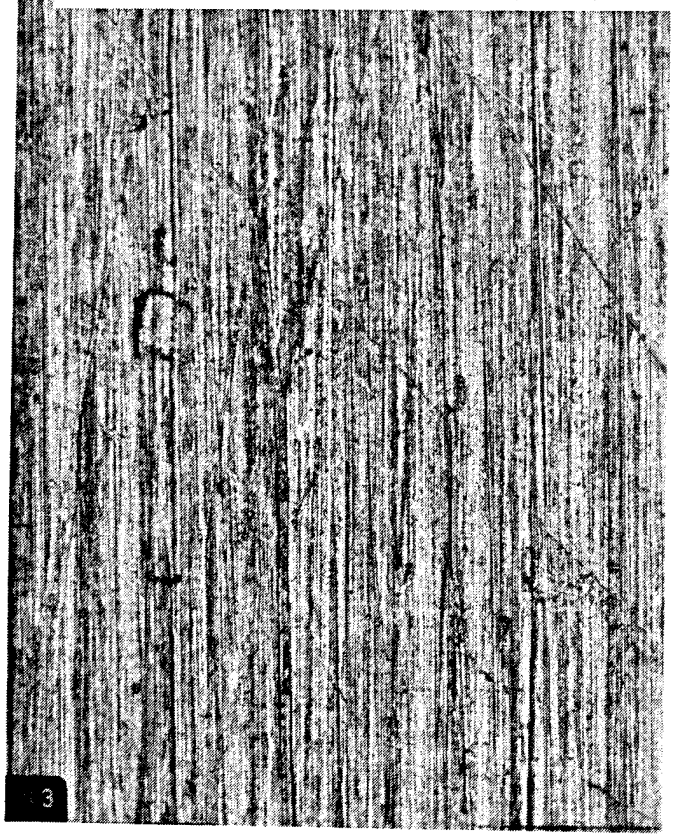
60Sn/40Pb, 08, 1-hour Soak, EZE 244, 100%, 120F



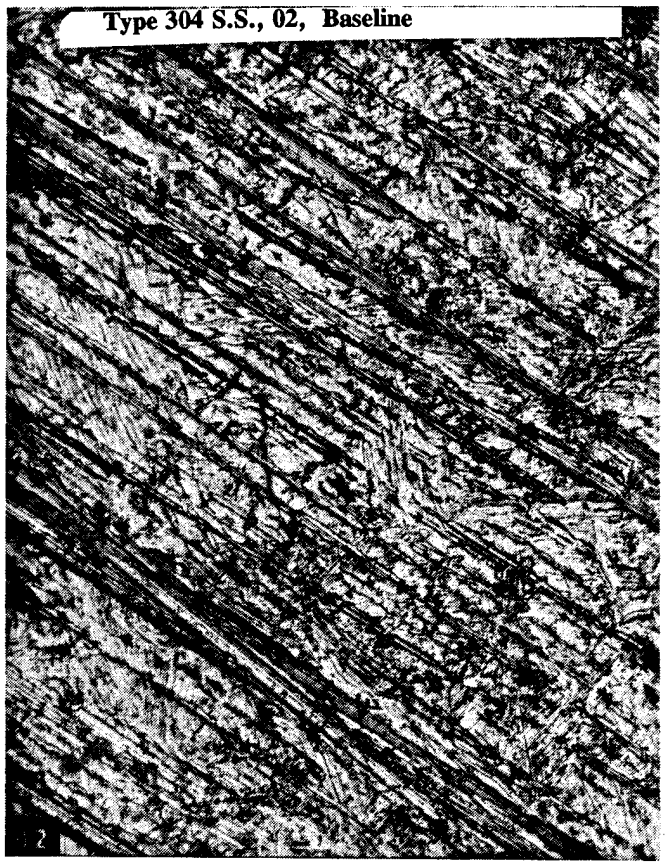
60Sn/40Pb, 14, 1-hour Soak, Intex 8284, 15%, 120F



60Sn/40Pb, 20, 1-hour Soak, CFC-113, 100%, 120F



Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.



Magnification = 200X (1 centimeter = 50 μm). See page J-1 to interpret captions on photographs.

Appendix K

Oxygen Solubility in Water as Function of Temperature

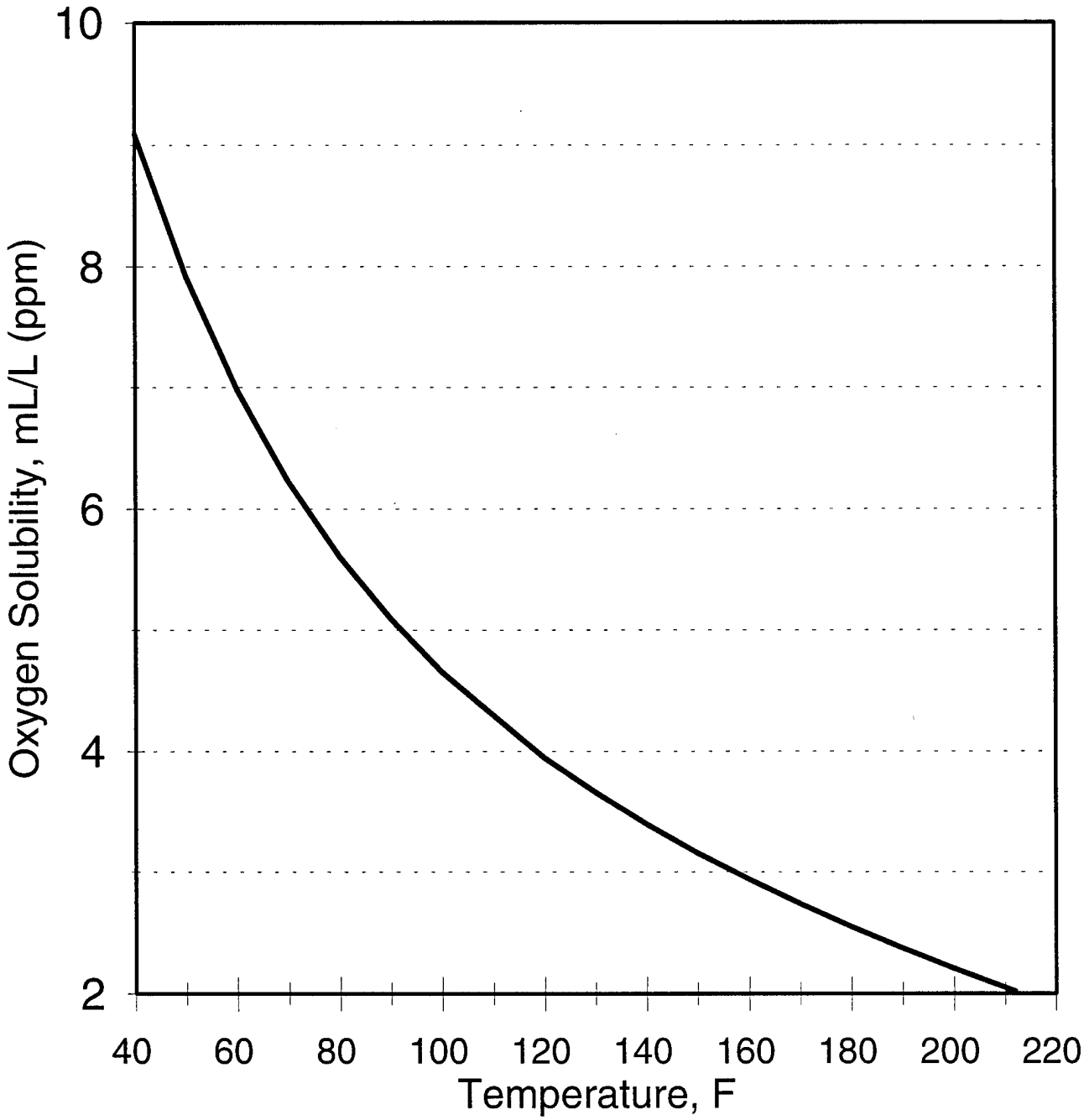
The solubility of oxygen in water varies inversely with temperature and is given by equation K-1. The graph of this equation is shown on page K-2. Additions to water such as cleaners or salt will further decrease the oxygen solubility.

$$\ln[0_2] = -173.43 + 249.63\left(\frac{100}{T}\right) + 143.35\ln\left(\frac{T}{100}\right) - 21.85\left(\frac{T}{100}\right) \qquad \textbf{(K-1)}$$

where T is temperature in degrees Kelvin (K),

O_2 is oxygen concentration in milliliters per liter (mL/L).

Solubility of Oxygen in Water



Appendix L

Chemical Analysis of Cleaner Solutions

Table L-1 lists the results of the chemical analysis of some of the cleaner solutions, using the inductively coupled plasma (ICP) technique. In addition to the elements listed in the table, the following elements were detected at levels below one μg/mL (ppm): Zn, Ti, V, Cu, Ni, Mn, As, Se, Sr, Cd, Sb, Ag, Mg, and Pb. Carbon, though probably present in these solutions, is not typically detected by the ICP technique.

The right-most column of the table lists the calculated maximum concentrations of the tested alloy, that could have dissolved in its cleaner solution, based on coupon weight loss measurements.

Table L-1. Results of ICP Analysis of Cleaner Solutions

Cleaner	Alloy Tested	Test Conditions	Element Detected, µg/ml (ppm)									Conc. of alloy calculated by Weight Loss* (µg/ml)
			B	Al	Sn	Fe	K	Be	Si	Ca	Na	
DI H_2O control	none	120 F	0.6	<1	<5	<0.1	<25	<0.01	<1	<0.1	<1	not applicable
Intex 8284 control	none	120 F	30.0	<1	<5	0.1	<25	<0.01	<1	2.0	150	
Brulin control	none	120 F	5.0	<1	20	0.1	500	<0.01	200	0.3	250	
CFC-113 control	none	115 F	0.05	<1	<5	0.1	<25	<0.01	400	<0.1	<1	
DI H_2O after test	Anodized AA2017	120 F, 16-hr soak	2.0	<1	<5	<0.1	<25	<0.01	2	0.1	<1	-7.1
Intex 8284 after test	4750 steel	120 F, 16-hr soak	30.0	<1	<5	10.0	<25	<0.01	<1	2.0	150	17
DI H_2O after test	Beryllium	120 F, 16-hr soak	2.0	<1	<5	0.3	<25	0.05	1	<0.1	<1	0.2
Intex 8284 after test	Beryllium	120 F, 16-hr soak	30.0	<1	<5	0.5	<25	4.0	<1	2.0	150	6.3
Brulin after test	Beryllium	120 F, 16-hr soak	5.0	<1	20	0.2	6000	0.4	200	0.5	300	0.6
CFC-113 after test	Beryllium	120 F, 16-hr soak	<0.05	<1	10	<0.1	<25	<0.01	75	<0.1	20	-0.1

* A negative weight loss indicated that the coupon gained weight after soaking in the test solution.
Shaded cells highlight comparison of calculated concentrations of the tested alloy, based on weight loss, to the alloy's major elemental constituent detected by ICP.