materials

MDPI

Article

Mechanical and Plasma Electrolytic Polishing of Dental Alloys

Katharina Witzke [1,*], Renko Kensbock [1], Caroline Ulrike Willsch [1], Katja Fricke [2], Sander Bekeschus [2,3,†] and Hans-Robert Metelmann [1,†]

[1] Department of Oral, Maxillofacial, and Plastic Surgery, Greifswald University Medical Center, Sauerbruchstr., 17475 Greifswald, Germany; renko.kensbock@med.uni-greifswald.de (R.K.); caroline.willsch@aol.de (C.U.W.); metelman@uni-greifswald.de (H.-R.M.)
[2] Leibniz Institute for Plasma Science and Technology (INP), Felix Hausdorff-Str. 2, 17489 Greifswald, Germany; fricke@nebula-biocides.de (K.F.); sander.bekeschus@gmail.com (S.B.)
[3] Clinic and Policlinic for Dermatology and Venerology, Rostock University Medical Center, Strempelstr. 13, 18057 Rostock, Germany
* Correspondence: katharina.witzke@med.uni-greifswald.de
† These authors contributed equally to this work.

Table S1. Heraenium® Sun sample roughness R_a and associated standard deviation ΔR_a obtained from AFM analysis (line length of 100 µm) after conventional mechanical polishing, plasma electrolytic polishing, and unpolished sandblasted state.

sample	conventional mechanical polishing		plasma electrolytic polishing		sandblasted (unpolished)	
Heraenium®	R_a (nm)	ΔR_a (nm)	R_a (nm)	ΔR_a (nm)	R_a (nm)	ΔR_a (nm)
1	108.41	12.96	170.38	51.28	1144.86	355.40
2	109.07	5.31	207.74	58.14	904.03	236.00
3	105.43	11.75	175.62	39.49	1617.70	628.37
4	76.15	25.24	159.84	60.97	1031.52	327.77
5	158.65	8.33	311.54	100.24	718.83	167.15
6	129.43	13.68	238.01	21.59	607.33	294.26
7	238.00	57.76	196.00	81.90	902.29	233.89
8	154.89	5.49	721.87	288.43	575.20	113.49
9	120.70	18.01	223.22	92.48	1223.10	298.28
10	140.71	70.33	478.80	149.90	1187.77	221.01
mean	**134.14**	**22.89**	**288.30**	**94.44**	**991.26**	**287.56**

Table S2. Wironit® sample roughness R_a and associated standard deviation ΔR_a obtained from AFM analysis (line length of 100 µm) after conventional mechanical polishing, plasma electrolytic polishing, and unpolished sandblasted state.

sample	conventional mechanical polishing		plasma electrolytic polishing		sandblasted (unpolished)	
Wironit®	R_a (nm)	ΔR_a (nm)	R_a (nm)	ΔR_a (nm)	R_a (nm)	ΔR_a (nm)
1	186.64	18.08	242.12	65.00	994.05	139.25
2	140.24	18.58	242.47	49.33	2397.50	917.81
3	223.06	9.08	248.45	26.95	836.43	284.73
4	140.16	11.87	233.52	47.91	1316.90	165.60
5	132.40	8.70	186.99	35.03	1161.86	341.81
6	53.02	7.15	492.69	102.29	1036.10	649.67

7	124.06	21.22	245.89	36.25	976.19	223.32
8	40.93	5.96	270.78	61.55	1390.50	228.28
9	35.75	3.22	235.31	42.94	1031.51	235.24
10	67.73	3.33	214.97	20.72	732.10	122.43
Mean	**114.40**	**10.72**	**261.32**	**48.80**	**1187.31**	**330.81**

Table S3. Sample weight loss due to plasma electrolytic polishing.

sample		time (min)	weight before plasma polishing (g)	weight after plasma polishing (g)	weight difference (g)	relative difference (%)
BMA	1a	5	2.644	2.586	0.058	2.194
BMA	2a	10	6.600	6.339	0.261	3.955
BMA	3a	20	6.168	5.685	0.483	7.831
BMA	4a	30	3.615	3.148	0.467	12.918
BMA	5a	5	5.844	5.732	0.112	1.917
BMA	6a	5	4.917	4.816	0.101	2.054
BMA	7a	5	2.509	2.443	0.066	2.630
BMA	8a	5	1.786	1.733	0.053	2.968
BMA	9a	5	2.173	2.122	0.051	2.347
BMA	10a	5	2.278	2.221	0.057	2.502
PDA	1a	5	2.492	2.440	0.052	2.087
PDA	2a	10	1.407	1.318	0.089	6.326
PDA	3a	20	1.975	1.754	0.221	11.190
PDA	4a	30	1.913	1.562	0.351	18.348
PDA	5a	5	1.422	1.378	0.044	3.094
PDA	6a	5	1.486	1.438	0.048	3.230
PDA	7a	5	1.583	1.534	0.049	3.095
PDA	8a	5	1.921	1.862	0.059	3.071
PDA	9a	5	1.305	1.263	0.042	3.218
PDA	10a	5	1.298	1.256	0.042	3.236

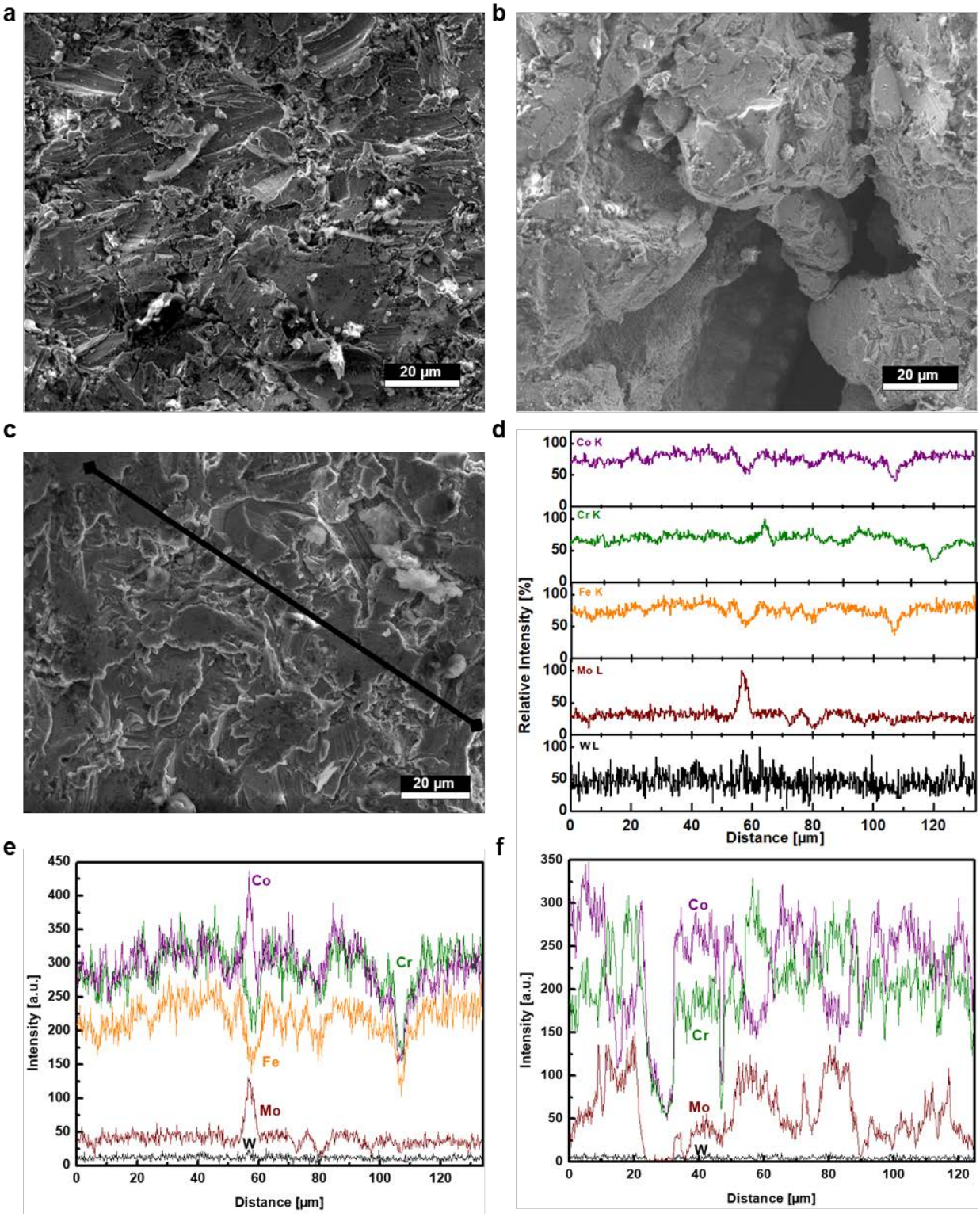

Figure S1. Sandblasted specimens in the unpolished reference state. (a) An image of an unpolished Heraenium® Sun specimen is shown (1000-fold magnification; SEM). (b) A ravine is found on an unpolished Heraenium® Sun specimen (1000-fold magnification; SEM). (c) A sandblasted Heraenium® Sun (BMA) specimen is analyzed with EDX along a defined line. (d–e) Co, Cr, Mo and W were selected and are shown in corresponding concentration curves (1000-fold magnification; SEM and EDX). (f) Sandblasted Wironit® (PDA) specimen analyzed with EDX along a defined line. Mo, Cr, Co and W were selected and are shown in corresponding concentration curves (1000-fold magnification; EDX). Absolute intensities are shown. Relative intensities are found in *Figure 3b -c* with the original SEM image.