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The electrochemical behaviours of eight alloys used for fixed partial denture and their respective postsolder alloys, were specified in solutions of NaCl with various conditions. A follow up of corrosion potential, measurements of the polarization resistance and potentiodynamic experiment, were performed on all alloys. Comparisons were done with data of the Pourbaix's diagram for all the major elements belonging to each studied alloy.

Fixed partial denture and postsolder joint



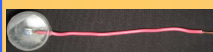
Different units of fixed partial denture (parent alloy covered by ceramic) are secondary joint by a postsolder joint. This postsolder and a part of parent alloy can be exposed to saliva.

noble alloys	Au	Pt	Pd	Ga	In	others
dSIGN98	86	12	/	/	/	2.0 Zn
Aquarius Hard	86	8.5	2.6	/	1.4	
dSIGN91	60	/	31	1.0	8.4	
Lodestar	52	/	39	1.5	8.5	
W	54	/	26	/	1.5	16 Ag 2.5 Sn
less noble alloy	/	/	59	/	2.7	28 Ag 8.2 Sn - 1.3 Zn
dSIGN59	/	/	59	/	2.7	28 Ag 8.2 Sn - 1.3 Zn
not noble alloys	Ni	Cr	Mo	W	Si	others
4ALL	61	26	11	/	1.5	/
Pisces Plus	62	22	/	11	2.6	2.3 Al

solder alloys	Au	Ag	Cu	Ga	others	for
.650	65	13	20	2		Aquarius Hard
.615	61	13	17	/	7.6 In	dSIGN91, d59, Lodestar
.585	59	16	18	7	/	dSIGN98
LPWG	56	27	/	/	16 Zn	W, Pisces Plus, 4ALL

All alloys and solders were supplied by IVOCCLAR VIVADENT

Experimental Setup



Working electrode



Electrochemical cell and the three electrodes.

The studied electrolytes were:

- pH=6.6; 9g/L NaCl
- pH=7.4; 9g/L NaCl
- pH=7.4; 90g/L NaCl

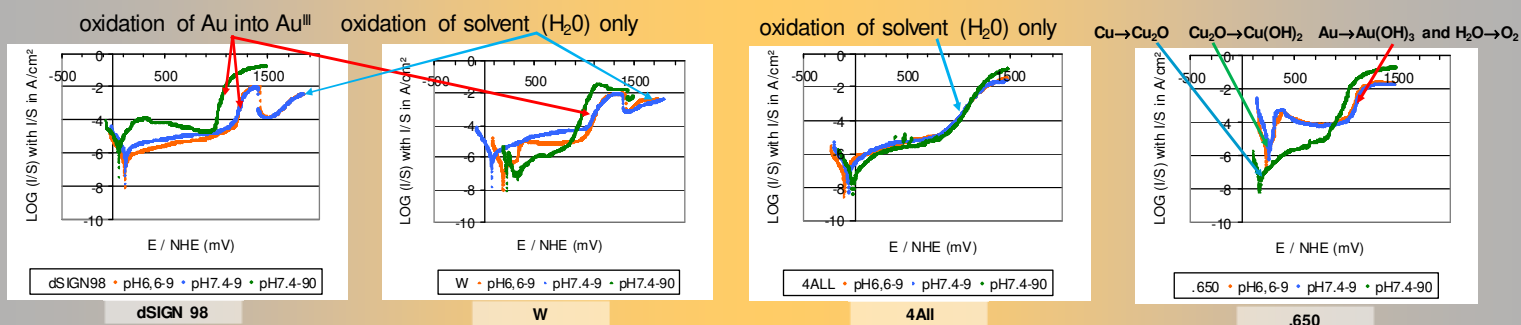
All these solutions were prepared from distilled water, pure NaCl and NaOH or HCl for adjustment of pH

Free potential & polarization resistance : example of 4 parent alloys

Alloy	Electrolyte	E _{corr} / NHE (mV) at t =			Rp (kOhm x cm ²)	
		0h	1h	2h	at t = 1h	at t = 2h
Aquarius Hard	pH6.6 9g/L	+330	+350	+350	520	560
	pH7.4 9g/L	+280	+370	+390	790	430
	pH7.4 90g/L	+290	+300	+300	1040	1440
dSIGN91	pH6.6 9g/L	+250	+230	+240	23	26
	pH7.4 9g/L	+210	+190	+200	11	13
	pH7.4 90g/L	80	+240	+250	610	1190
dSIGN59	pH6.6 9g/L	+40	+21	+16	5	4
	pH7.4 9g/L	+41	+39	+34	10	10
	pH7.4 90g/L	+470	+440		92	73
Pisces Plus	pH6.6 9g/L	110	+17	+32	350	420
	pH7.4 9g/L	74	+41	+28	660	580
	pH7.4 90g/L	130	110	100	200	330

- For the noblest alloys : E_{corr} is high, the noblest elements are in immunity state, others elements in passivated state.
- For the dSIGN 59 : E_{corr} is lower, main elements in immunity state or passivated state.
- For the NiCr based Pisces Plus : E_{corr} very low, all elements in passivated state
- Polarization resistances are extremely variable but all at very high level

Examples of potentiodynamic curves obtained in different media



- Oxidation of gold, the base element of the noblest alloys, is possible only for very high potentials
- A very high chloride concentration induced an enlargement of the anodic peak toward lower and higher potentials
- The not noble alloys were obviously already passivated when potentiodynamic experiment began
- The postsolder alloys displayed a small anodic peak and a passivation plateau. A possible specific behaviour of copper (for three alloys on four), which seemed fixing the corrosion potential (before potentiodynamic polarisation).

CONCLUSION

Generally, there was no corrosion for all these alloys, which were in the immunity domains or passivation domains of their constitutive elements.

Nevertheless, corrosion can begin if an especially high anodic potential is applied because of high concentration of strong oxidant species, notably if Cl ions are in high concentration in the same time.