EXPERTISE IN

Implant Superstructures

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MATERIALS SCIENCE

The number of dental restorations on implants is continuously increasing. Most of the implant-supported restorations are still fabricated on alloys.
Therefore, these alloys have to meet certain criteria:

1) *Physical properties*
2) *Corrosion resistance / biocompatibility*
3) *Ease of use / capability of being cast on other alloys*

The objective in the development of alloys is to fulfill the criteria mentioned above.

1) Physical properties

The physical and mechanical requirements of the cast implant superstructure vary according to the size and extension. Single units and short-span bridges do not require the same degree of strength and rigidity as long-span bridges and cantilevered extensions.

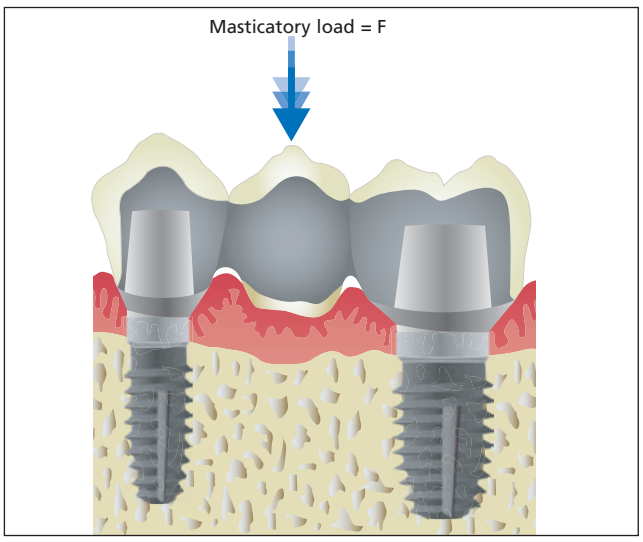
There are many physical and mechanical properties that determine the suitability of an alloy for use in an implant superstructure.

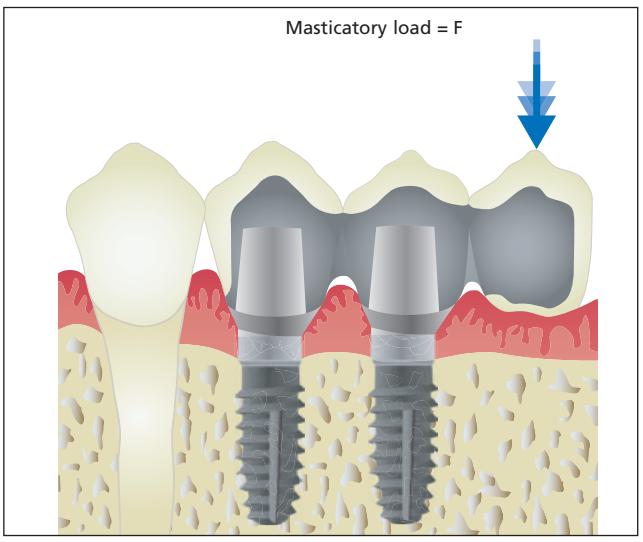
The **0.2% proof strength** indicates the maximum stress an alloy can withstand before permanent deformation. The higher the value, the stronger is the alloy. This strength is particularly important in implant superstructures. Higher proof strength can overcome bending forces and thus prevent transmission of damaging forces to the implants and the jaw.

At the same time, it is important that the alloy exhibits a high resistance to elastic deformation. The higher the **modulus of elasticity**, the more rigid is the alloy. The combination of 0.2% proof strength (> 470 MPa) and a high modulus of elasticity results in a stiff and stable alloy. If the framework is correctly designed, the framework absorbs the mastication forces without deforming. Consequently, there are no bending forces that act on the implant.

Hardness is defined as the resistance of an alloy to indentation. It is a measure of the surface strength and thus an indicator for the finishing and polishing properties of an alloy. The ability to achieve and maintain a highly polished surface is critical to ensure the biocompatibility and corrosion resistance.

In addition to purely physical properties, alloys also have to exhibit a high **heat resistance** to achieve an excellent (passive) accuracy of fit after thermal treatment during porcelain application. Distortion results in an improper fit of the restoration and thus in a non-physiological force acting on the implant. It is therefore critical to ensure that the melting range of the implant alloy is high enough to withstand the highest temperatures of oxidation and ceramic firing.



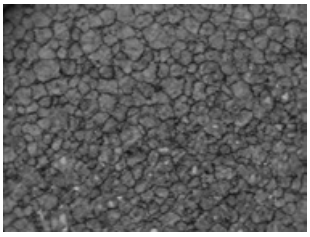


2) Biocompatibility / corrosion resistance

Apart from the mechanical properties, the long-term success of a metal-supported implant restoration depends on the biocompatibility and corrosion resistance of the alloy. In implant-supported restorations, the alloy and implant (usually titanium) are in direct contact. Therefore, alloys have to be highly corrosion resistant to avoid galvanic reaction, which leads to corrosion.

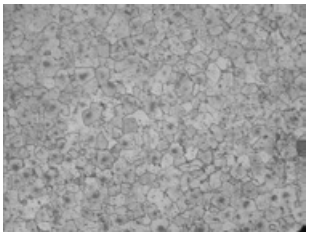
In addition to the selection of the individual metals and the selective composition of the alloy, the structure plays a major role. A homogeneous structure with an even grain size distribution ensures a high corrosion resistance and promotes the finishing and polishing properties, which in turn further improves the passive corrosion resistance.

A biocompatible alloy can be placed in the human body without causing any side effects. Therefore, all our alloys are tested on their biocompatibility and on their corrosion resistance in accordance with ISO standards.



Grain size distribution Callisto Implant 60

Callisto Implant 60 / IPS InLine



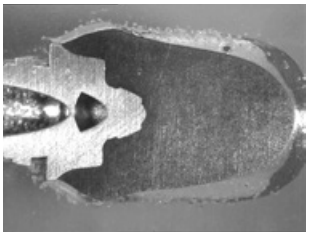
Grain size distribution Callisto Implant 78

Callisto Implant 78 / IPS InLine

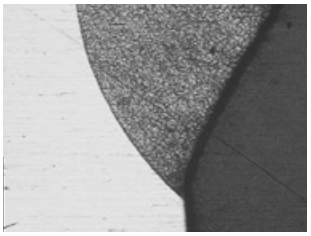
3) Ease of use / capability of being cast on

The ease of use of an alloy, which is determined by the casting, grinding and polishing properties, is a prerequisite.

In the application of implant superstructures, however, another aspect is of utmost importance: an alloy must be capable of being cast on another alloy. A variety of implant systems offer gold copings or gold-resin abutments that allow another alloy to be cast onto them. The abutments consist of a gold-platinum alloy on which the alloy is directly cast. The alloy to be cast on has to be selected depending on the melting range of the abutment alloy. A good metal bond depends on the casting temperature and the flow properties of the alloy. Our alloys have been cast onto different gold abutments in test series in order to confirm the compatibility between the parent metal and the abutment.



Gold Abutment / Callisto Implant 78



Metallic interface gold abutment / Callisto Implant 78

Wax-up abutment

Sprued abutment with cooling fans

Proper cast on gold abutment

The right alloy for everyone

Despite their different compositions, a variety of our alloys already meet the materials science requirements for implant superstructures. In addition, the alloys have been tested for their compatibility with veneering ceramics, such as IPS d.SIGN®, IPS InLine® System and IPS Classic® or with the SR Adoro® veneering composite. Therefore, you can process your restoration quickly.

ALLOYS OVERVIEW

Crown and Bridge alloys	Au	Pt	Pd	Ag	0.2 % proof strength	E-modulus	Cast-on capability	Compatible with SR Nexco / SR Link SR Adoro	Compatible with SR Chroma Link / SR Chromasit / SR Link	Compatible with SR Link / SR Ivocron
High Gold content										
Harmony® KF	75.1	3.2	6.8	10.2	530	84.000	✓	–	–	–
Harmony® PF	72.0	3.6	–	13.7	525	89.000	✓	✓	✓	✓
Academy Gold™ XH	70.7	3.6	–	13.7	505	86.000	✓	✓	✓	✓
Reduced Gold content:										
Harmony® X-Hard	68.3	2.9	3.6	10.0	735	93.000	✓	✓	✓	✓
XL-X®	62.8	–	3.9	16.1	690	105.000	✓	✓	✓	✓
Maxigold®KF	56.6	–	8.4	29.0	480	81.000	✓	–	–	–
Midigold®50	50.0	–	3.5	35.0	470	74.000	✓	✓	✓	✓
Magenta®	50.0	–	6.5	21.0	820	86.000	✓	✓	✓	✓

Universal alloys	Au	Pt	Pd	Ag	0.2 % proof strength	E-modulus	Cast-on capability	Compatible with SR Nexco / SR Link SR Adoro	Compatible with SR Chroma Link / SR Chromasit / SR Link	Compatible with SR Link / SR Ivocron
BioUniversal®	59.4	2.0	9.5	25.5	480	103.000	✓	–	–	–

Implant alloys	Au	Pt	Pd	Ag	0.2 % proof strength	E-modulus	Cast-on capability	Compatible with IPS d.SIGN	Compatible with IPS InLine / IPS InLine One	Compatible with IPS InLine PoM	Compatible with IPS Classic
Callisto® Implant 78	78.6	9.7	7.9	–	600	110.000	✓	✓	✓	✓	✓
Callisto® Implant 33	33.0	–	52.8	7.2	500	120.000	✓	✓	✓	✓	✓
IS® 64	2.8	1.0	59.9	26.0	560	124.000	✓	✓	✓	–	✓
Callisto® Implant 60	2.0	<1.0	60.0	25.2	610	130.000	✓	✓	✓	–	✓

Ceramic alloys	Au	Pt	Pd	Ag	0.2 % proof strength	E-modulus	Cast-on capability	Compatible with IPS d.SIGN	Compatible with IPS InLine / IPS InLine One	Compatible with IPS InLine PoM	Compatible with IPS Classic
High Gold content:											
d.SIGN® 98	85.9	12.1	–	–	510	80.000	✓	✓	✓	✓	✓
Aquarius XH	82.8	9.0	5.0	–	510	83.000	✓	✓	✓	✓	✓
Y-Lite	75.0	–	18.8	2.0	500	88.000	✓	✓	✓	✓	✓
Sagittarius	75.0	2.0	16.8	2.0	580	94.000	✓	✓	✓	✓	✓
Reduced Gold content:											
d.SIGN® 91	60.0	–	30.6	–	500	108.000	✓	✓	✓	✓	✓
W-5	52.2	<1.0	26.0	17.1	505	118.000	✓	✓	✓	–	✓
Lodestar®	51.5	–	38.5	–	495	98.000	✓	✓	✓	✓	✓
W-3	48.7	–	39.6	–	495	128.000	✓	✓	✓	✓	✓
W-2	44.8	–	40.5	5.9	540	113.000	✓	✓	✓	✓	✓
Evolution® Lite	40.3	–	39.3	9.2	565	130.000	✓	✓	✓	–	✓
Containing Palladium											
Capricorn 15	15.0	–	51.9	23.0	490	101.000	✓	✓	✓	–	✓
d.SIGN® 84	9.0	–	75.2	3.0	495	117.000	✓	✓	✓	✓	✓
d.SIGN® 67	4.0	–	62.7	20.0	545	104.000	✓	✓	✓	–	✓
Spartan Plus	2.0	–	78.8	–	795	97.000	✓	✓	✓	✓	✓
Spartan®	2.0	–	78.7	–	945	94.000	✓	✓	✓	✓	✓
Capricorn	6.0	–	78.1	3.0	525	97.000	✓	✓	✓	✓	✓
Protocol®	6.0	–	75.2	6.5	500	103.000	✓	✓	✓	✓	✓
Callisto® 75 Pd	2.5	–	75.2	7.1	500	117.500	✓	✓	✓	✓	✓
d.SIGN® 59	–	<1.0	59.2	27.9	490	139.000	✓	✓	✓	–	✓
d.SIGN® 53	–	<1.0	53.8	34.9	545	132.000	✓	✓	✓	–	✓
W-1	–	–	53.3	37.7	485	114.000	✓	✓	–	–	–
Callisto® CPG	<1.0	–	24.6	–	665	230.000	–	✓	✓	✓	✓

Predominantly base alloys	Co	Cr	Mo	W	0.2 % proof strength	E-modulus	Cast-on capability	Compatible with SR Nexco / IPS d.SIGN SR Link / SR Adoro	Compatible with IPS InLine / IPS InLine One / SR Chroma Link / SR Chromasit / SR Link	Compatible with IPS InLine PoM SR Chroma Link / SR Chromasit / SR Link	Compatible with IPS Classic SR Link / SR Ivocron
d.SIGN® 30	60.2	30.1	<1.0	–	520	234.000	–	✓✓	✓✓	✓	✓✓
Colado® CC	59.0	25.5	5.5	5.0	500	198.000	–	✓✓	✓✓	✓	✓✓

The range of available alloys may vary from country to country.

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603425/2014-06/en

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