Material data sheet

EOS CobaltChrome SP2 for EOSINT M 270

A number of different materials are available for use with EOSINT M systems, offering a broad range of e-Manufacturing applications. EOS CobaltChrome SP2 is a cobalt-chrome-molybdenum-based superalloy powder which has been especially developed to fulfil the requirements of dental restorations which have to be veneered with dental ceramic material and has been optimized especially for processing on EOSINT M 270 systems. Other materials are also available for EOSINT M systems, and further materials are continuously being developed - please refer to the relevant material data sheets for details.

Description, application

EOS CobaltChrome SP2 is a Cobalt based metallic material for production of dental restorations in EOSINT M270 system.

EOS CobaltChrome SP2 is a Co, Cr, Mo and W based alloy in fine powder form. Its composition corresponds for type 4 CoCr dental material in EN ISO 22674:2006 standard. It also fulfills the chemical and thermal requirements of EN ISO 9693 for CoCr PFM (porcelain fused metal) of dental materials (Ni content: < 0.1 %, no Cd or Be) and requirements of EN ISO 7504, EN ISO 10993-1:2003 and 10993-5:1999 regarding the biocompatibility and cytotoxity of the dental materials.

This material is ideal for producing dental restorations. Standard processing parameters use full melting of the entire geometry with 20 µm layer thickness.

Typical application:

- dental restorations (crowns, bridges etc.)

Maximum time of usage:

When following the operation instructions issued by EOS, EOS CobaltChrome SP2 powder lots can be safely used up to 3 years from production date of the particular CobaltChrome SP2 lot.

The production week of the lot is defined in lot code in following way. E.g. in lot no "H150801" letter "H" is manufacturing identification code of CoCrSP2, number "15" identifies production week, number "08" identifies production year and number "01" identifies the lot being the first of the material produced on week 15 of 2008.

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Instructions for use

Designing the restorations

Design the restorations following the design rules provided.

Shot peening

Shot peen the parts using fine ceramic media (e.g. Iepco C type or Zirblast B60) using 2.5-3.5 bar pressure. Shot peen the fitting surface until the visual saturation has been reached.

Do not use any metallic shot peening media to avoid contaminating the surfaces of the copings!!

Stress relieving in furnace

Stress relieving of the bridges containing 4 or more units or fully dense pontics is being done in stress relieving furnace under argon atmosphere. The stress relieving sequence is following:

Use the 1-2 l/min Ar flow into protective gas box

1: ramp up to 450 °C in 60 minutes

2: holding for 45 minutes

3: ramp up to 750 °C in 45 minutes

4: holding for 60 minutes

5. Furnace heating power off and open the furnace door when temperature dropped down to approx. 600 °C.

6. Remove the protective gas box when furnace has cooled down to approx. 300°C and shut down the argon flow.

Veneering by ceramic

Use only the veneering materials and processes suitable for coefficient of thermal expansion of CobaltChrome SP2. The most recommended veneering materials are VITA VM13 and Wieland Reflex. Always follow the instructions of the ceramic manufacturer!

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Technical data

NOTE!! Preliminary pilot phase properties! Data highlighted in yellow subject to change prior market launch of CobaltChrome SP2!

General process and geometric data

Typical achievable dental part accuracy	
- copings and bridges up to approx. 4 elements	*± 20 µm* *± 0.8 mil*
- bridges up to approx. 8 elements after subsequent stress relieving at 750 °C for 1 hour	*± 20 µm* *± 0.8 mil*
Min. wall thickness [1]	*0.3 mm* *0.012 in*
Surface roughness (µm)	
- as laser-sintered	*approx. R_a 8 µm, R_z 30 - 50 µm* *R_a 0.39, R_z 1.6 - 2.0 mil*
- after polishing	*R_z up to < 1µm* *R_z up to < 0.04 mil*
Volume rate [2]	
- full melting parameters (no Skin&Core, full density, maximum strength)	*1.98 mm³/s*
- faster Skin&Core parameters	*2.2 mm³/s*

[1] Mechanical stability is dependent on geometry (wall height etc.)

[2] Volume rate is a measure of build speed during laser exposure. The total build speed depends on the average volume rate, the recoating time (related to number of layers) and other factors such as DMLS-Start settings.

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Physical and chemical properties of parts

Material composition	*Co: 62 - 66 wt-%* *Cr: 24 - 26 wt-%* *Mo: 5 –7wt-%* *W: 4 – 6 wt-%* *Si: max. 0.8 – 1.5 wt-%* *Mn: max. 1.5 wt-%* *Fe: max. 0.7 wt-%*
Relative density with standard parameters	approx. 100 %
Density with standard parameters	8.50 – 8.65 g/cm³

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Mechanical properties of parts at 20 °C, in as-processed condition

Ultimate tensile strength	1050 MPa ± 250 MPa
Yield strength (Rp 0.2 %)	750 MPa ± 150 MPa
Elongation at break, A5	10 – 16 %
Young's Modulus	200 GPa ± 30 GPa
Hardness HV10	320-380 HV

Mechanical properties of parts at 20 °C, after stress relieving at 750 °C for 1 hour and firing at 880°C for 5 minutes

Ultimate tensile strength	1150 MPa ± 250 MPa
Yield strength (Rp 0.2 %)	950 MPa ± 250 MPa
Elongation at break, A5	2 – 10 %
Young's Modulus	200 GPa ± 20 GPa
Hardness HV10	350 - 450 HV

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Thermal properties of material, after stress relieving at 750 °C for 1 hour and firing at 880°C for 5 minutes

Coefficient of thermal expansion (25-500 °C)	*13.9 – 14.3 x 10^{-6} m/m°C*
Melting interval	*1380 - 1440 °C*

The quoted values refer to the use of these materials with EOSINT M 270 systems according to current specifications (including the latest released process software PSW and any hardware specified for the relevant material) and operating instructions. All values are approximate. Unless otherwise stated, the quoted mechanical and physical properties refer to standard building parameters and test samples built in horizontal orientation. They depend on the building parameters and strategies used, which can be varied by the user according to the application. Measurements of the same properties using different test methods (e.g. specimen geometries) can give different results. The data are based on our latest knowledge and are subject to changes without notice. They are provided as an indication and not as a guarantee of suitability for any specific application.
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