Material data sheet

CE
0537

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.

1 Description, application

EOS CobaltChrome SP2 is a Cobalt based metallic material for production of dental restorations in EOSINT M 270 system. EOS CobaltChrome SP2 powder is class IIa medical device according to Medical Device Directive 93/42/EEC.

EOS CobaltChrome SP2 is a Co, Cr, Mo and W based alloy in fine powder form. Its composition corresponds to 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 cytotoxicity 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.)

EOS GmbH - Electro Optical Systems

Robert-Stirling-Ring 1
D-82152 Krailling / München

Telephone: +49 (0)89 / 893 36-0
Telefax: +49 (0)89 / 893 36-285
Internet: www.eos.info

2. Hold temperature for 45 minutes.
3. Heat furnace to 750 °C in 45 minutes.
4. Hold temperature for 60 minutes.
5. Switch furnace heating off. When temperature dropped down to approx. 600 °C, open the furnace door.
6. When furnace has cooled down to approx. 300°C remove the protective gas box and shut down the argon flow.

Veneering by ceramic

Use only the veneering materials and processes suitable for coefficient of thermal expansion of EOS CobaltChrome SP2 (14.0 – 14.5 x 10^{-6} m/m°C, at 25-500 °C). The most recommended veneering materials are VITA VM13 and Wieland Reflex. Always follow the instructions of the ceramic manufacturer!

Surface Preparation

You can finish the surface with a cross-cut drill, a diamond milling tool or a fine carbide, ceramically bonded stone. After finishing, blast the surface with Al2O3 (Korox) at 3–4 bar and steam clean it.

Oxide Firing

Oxide firing is recommended. You can carry out the oxide firing to check the surface at 950 – 980°C for 5 minutes with vacuum. Always blast the oxide after firing with Al2O3 at 3-4 bar and steam clean it.

Ceramic Firing

Always apply the opaque material in two firing operations. Apply a thin first layer (Washbrand) and the second layer opaque. Wash off part under running water before applying the next ceramic coating. We recommend a long term cooling phase (up to approximately 600°C). Remove ceramic only mechanically. Hydrofluoric acid (HF) corrodes the metal.

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D-82152 Krailling / München

Soldering

Use only the soldering materials and processes suitable for coefficient of thermal expansion of EOS CobaltChrome SP2. Always follow the instructions of the soldering material manufacturer!

To do soldering prior to firing with the flame BEGO Wirobond solder and Fluxsol flux are most recommended.

To do soldering after firing in the furnace BEGO WGL solder and Minoxyd flux are most recommended. Long-term cooling recommended (cooling phase up to approx. 600 °C).

Laser welding

Use only the welding materials and processes suitable for coefficient of thermal expansion of EOS CobaltChrome SP2. Always follow the instructions of the soldering material manufacturer!

To do laser welding filler material BEGO Wiroweld wire 0.35 mm diameter or 0.50 mm diameter are most recommended.

Secondary effects

Allergies to the contents of EOS CobaltChrome SP2 or electrochemically based reactions may very rarely occur.

3 Technical data

Note! For actual lot values please refer to Mill Test Certificate and/or Declaration of Laser Processed Properties of production lot!

Physical and chemical properties of parts, (according to EN ISO 22674:2006)

Material composition	Co: 61.8 – 65.8 wt-% Cr: 23.7 – 25.7 wt-% Mo: 4.6 – 5.6 wt-% W: 4.9 – 5.9 wt-% Si: 0.8 – 1.2 wt-% Fe: max. 0.50 wt-% Mn: max. 0.10 wt-%
Relative density with standard parameters	approx. 100 %
Density with standard parameters	Min. 8.50 g/cm³

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Mechanical properties of parts at 20 °C, in as manufactured condition, (according to EN ISO 22674:2006)

Ultimate tensile strength	Min.: 800 MPa, 116 ksi (typical: 1050 ± 100 MPa, 152 ± 15 ksi)
Proof strength (Rp 0.2 %)	Min.: 600 MPa, 87 ksi (typical: 750 ± 80 MPa, 109 ± 12 ksi)
Elongation at break, A5	Min.: 10 % (typical: 14 % ± 2 %)
Young's Modulus	Min.: 170 GPa (typical: 200 ± 20 GPa)
Hardness HV10	Min.: 320 HV (typical: 360 ± 20 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, (according to EN ISO 22674:2006)

Ultimate tensile strength	Min.: 900 MPa, 131 ksi (typical: 1100 ± 100 MPa, 160 ± 15 ksi)
Proof strength (Rp 0.2 %)	Min.: 700 MPa, 102 ksi (typical: 900 ± 80 MPa, 131 ± 12 ksi)
Elongation at break, A5	Min.: 2 % (typical: 10 % ± 2 %)
Young's Modulus	Min.: 180 GPa (typical: 200 ± 10 GPa)
Hardness HV10	Min.: 350 HV (typical: 420 ± 30 HV)

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D-82152 Krailling / München

Thermal properties of material, after stress relieving at 750 °C for 1 hour and firing at 880°C for 5 minutes, (according to EN ISO 22674:2006)

Coefficient of thermal expansion (25 - 500 °C)	14.0 – 14.5 x 10^{-6} m/m°C 7.78 – 8.06 x 10^{-6} in/in°F
Coefficient of thermal expansion (20 - 600 °C)	14.2 – 14.6 x 10^{-6} m/m°C 7.89 – 8.11 x 10^{-6} in/in°F
Melting interval	1380 - 1440 °C, 2516 – 2624 °F

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. 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. EOS®, EOSINT®, DMLS® and DirectPart® are registered trademarks of EOS GmbH.

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