Caution on ZEO CE LIGHT and Various Alloy Combinations

Thank you for using our PFM product, ZEO CE LIGHT.

Since ZEO CE LIGHT was released in 2001, it has been used in about 20 countries outside its home country of Japan. We take pride in ZEO CE LIGHT's stable properties, its aesthetics and its safety. This is a product which satisfies our clients and users such as dealers, dental technicians and dentists.

ZEO CE LIGHT is manufactured under strict production control systems based on ISO 13485 and Japanese Industrial Standards, and has been awarded a CE mark. ZEO CE LIGHT's standard coefficient of thermal expansion (CTE) is $13.6 \times 10^{-6}K^{-1}$ (25-500℃) ・ $13.8 \times 10^{-6}K^{-1}$ (50-500℃) for Dentine and Enamel, and this value matches the standard values of ISO and JIS. Moreover, the CTE of alloys matching with ZEO CE LIGHT is $13.7\sim15.0 \times 10^{-6}K^{-1}$ (50-500℃), allowing dental technicians to make use of this product with confidence and security.

ZEO CE LIGHT has been widely used along with precious metals such as Au-Pt alloys, Au-Pt-Pd alloys and Pd-Ag alloys, as well as Ni-Cr alloys and Co-Cr alloys. However, with the recent high price rises in the precious alloy market and the variation in the prices of non-precious alloys, newly released low-price Ni-Cr and Co-Cr alloys are being sold in many countries. These alloys vary in their properties such as strength, hardness, toughness and bonding strength, depending on the alloy. For example, some Ni-Cr alloys have properties with high hardness and low elongation values, and we have found that some of them have a hardness of more than HV400.

The issue here, however, is that such Ni-Cr or Co-Cr alloys may cause problems in terms of cracks in the porcelain, even though their CTE is $13.7\sim15.0 \times 10^{-6}K^{-1}$ (50-500℃,) which is within the limit value of ZEO CE LIGHT. The properties of these alloys put high stress on the porcelain side; this is especially true for alloys with high hardness and low elongation and bonding strength values. Cracks in the porcelain are the result. (Opaque products are not problematic in this way, as they are usually thinly applied, so that CTE stress does not feature as a major factor.

Against this background, we must expect that ZEO CE LIGHT may have crack issues when used with some of the new alloys which have high hardness and low elongation and bonding strength values. Please take this into consideration when new Ni-Cr and Co-Cr alloys are used with ZEO CE LIGHT.

Judging from the combination between ZEO CE LIGHT and metals, the stress on the porcelain side should be reduced. We strongly recommend using Ni-Cr alloys and Co-Cr alloys with CTE $14.1\times10^{-6}K^{-1}$ (25-500℃)・$14.2\times10^{-6}K^{-1}$ (50-500℃) as well as in contexts where hardness under HV320. Please do not use any alloys with low bonding strength.

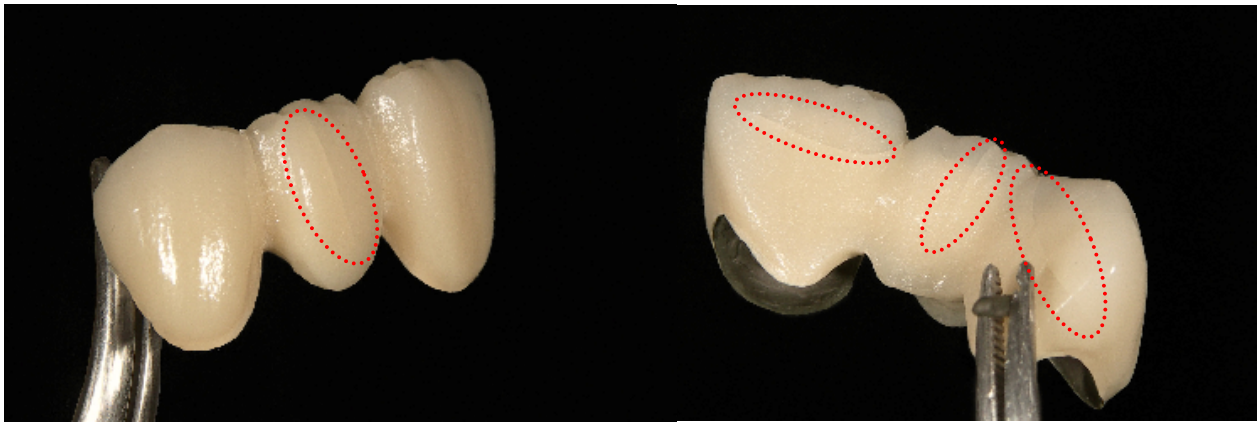
If you have any questions on this matter, please do not hesitate to contact us.
If you plan to change alloys or use new Ni-Cr or Co-Cr alloys, please let us know about the details of the alloys, and if there are any users who have already used new alloys, do please let us know.
We are in a position to supply ZEO CE LIGHT with CTE under $13.6\times10^{-6}K^{-1}$ (25-500℃)・$13.8\times10^{-6}K^{-1}$ (50-500℃) while staying within the limit values of ISO and JIS standards. This will reduce the risk of crack problems occurring.

[Crack Cases]

As stated the above, here is an example of how cracks occur.
ZEO CE LIGHT in use with Ni-Cr alloys: even though their CTE is $13.7\sim15.0\times10^{-6}K^{-1}$ (50-500℃),which is within the limit value of alloys (the published value is 13.7 and actual value was 14.0) and high hardness (the published value is HV373 and actual value HV425), cracks were observed. (Fig. 1)

On the other hand, ZEO CE LIGHT in use with Co-Cr alloys (the published value is 14.0 and actual value was 14.4) and hardness is (the published value is HV280 and actual value was HV290): cracks did not occur. (See Fig. 2)

Fig.1 Cracks occurred



Crack case：Ni-Cr alloy

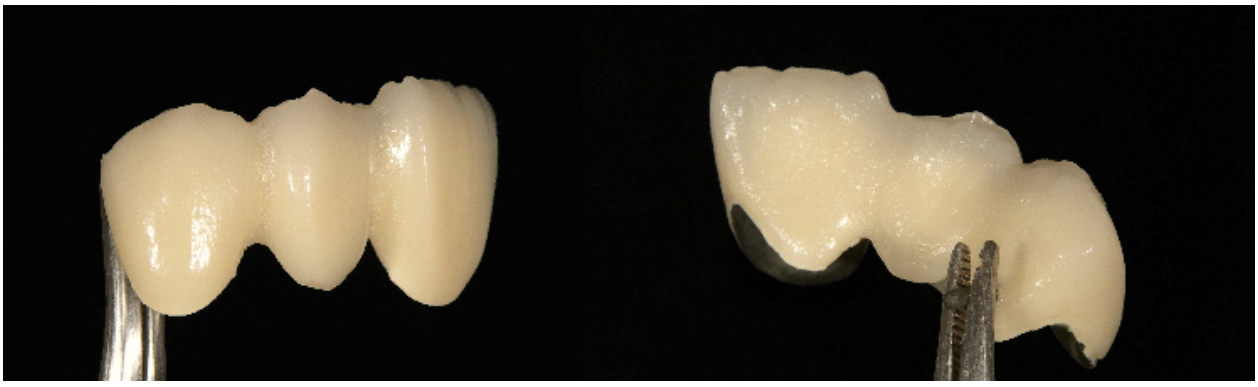
CTE：the published value $13.7\times10^{-6}K^{-1}$（25-500℃）

actual value $14.0\times10^{-6}K^{-1}$（25-500℃）

Hardness：the published value HV373

actual value HV425（after firing）

Fig.2 Cracks didn't occur



No Crack case：Co-Cr alloys

CTE：the published value $14.0\times10^{-6}K^{-1}$（25-500℃）

actual value $14.4\times10^{-6}K^{-1}$（25-500℃）

Hardness：the published value HV280（after firing）

actual value HV290（after firing）

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