

COLOROBRIA

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since 1921**



Welcome

**SUPER
SOLUTION FOR
SUPER WHITE**

LUXWHITE

CUSTOM FRITS FOR SUPER WHITES

**100%
TRANSLUCENT
WHITE**

**EXTRA SLIM
EXTRA LARGE SIZE**

**COMPLETE
SERVICE**



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Use of frits in body compositions
for high added value tiles



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Getting value through using special bodies



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Use of special bodies to produce highest value tiles



✔ Talking about slabs aimed at markets covered by non-ceramic supplies bringing the technical and aesthetic quality of the ceramic product.

✔ Possibility/need to differentiate on the market and to increase the selling price, at a very high end, different from the 'normal ceramics'.

✔ Perfect imitations of natural products: translucency, whiteness, "glassiness" and vividness of color.

✔ The use of glass ceramic frits in body compositions is the solution to obtain better technical and aesthetic results, not achieved with raw materials only.



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Use of frits in body compositions



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Use of frits in special bodies

✔ Frits for bodies (C-Special frits) are «glass ceramic products».

In the process of ceramic firing crystallize mineralogical phases that are not obtained from raw materials.

✔ Zirconium silicate contained in these frits is guaranteed and certified as low radioactivity material.

✔ Crystallization makes it possible to obtain:

- Whiteness, translucency and color development.
- Reduction of firing shrinkage.



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Improving aesthetical results

- ✓ From technological properties to aesthetic advantages:
 - High degree of whiteness : $L > 93$, $b < 3$.
 - Better integration, brightness and definition of graphics with the ceramic body because to the “glassiness” of the body.
 - High digital color performance: pink, yellow and green.
 - Best conditions for 'full digital' technology.





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Controlling technical properties

- ✓ From technological properties to technological and production advantages:
 - increased productivity due to lower firing shrinkage.
 - greater stability to the ceramic process being synthetic products less subject to variability than natural raw materials.
 - pyroplastic resistance due to the formation of a crystalline skeleton generated by the ceramic glass frits.



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Use of frits in hyper white compositions: Main constraints

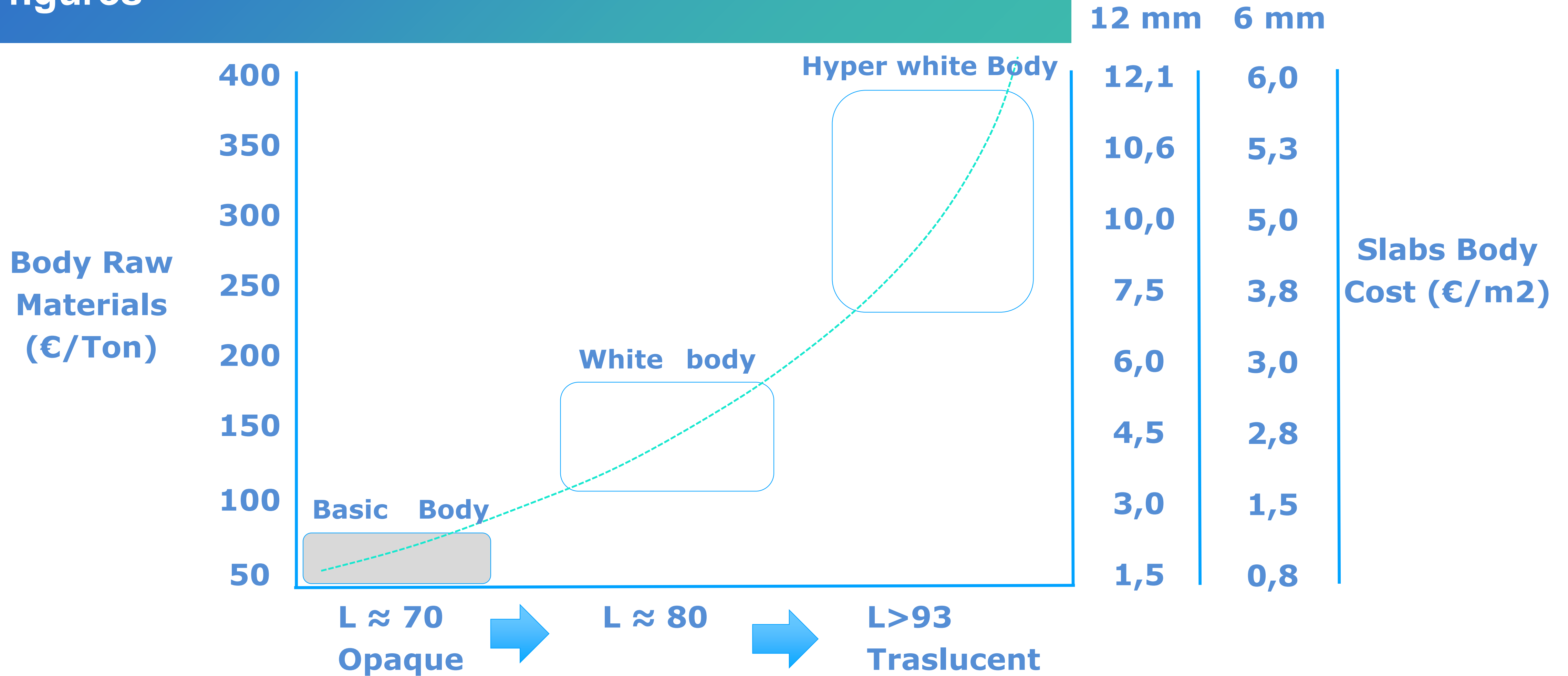
- ✓ Glass ceramic frits... the best solution with some constraints:
 - Higher cost.
 - Need for high quality and whiteness complementary raw materials.
 - Possible need for plasticizing additives complementary to clays.
 - Need of plants and machinery suitable for this technology:
 - Avoid pollution at every stage of the process.
 - Cooling cycles adequate to avoid tension in the fired slab.
 - The appropriate roller pitch to control pyroplastic deformation.



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Cost figures





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Colorobbia products and position



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Colorobbia Glass-Ceramic frits

Chemical Composition	Crystallization	Crystallization Temperature	Characteristics
Ca-Mg-Al-Si (CMAS)	Anortite-Diopside	940° c	Improves translucency, control shrinkage and pyroplasticity
Zr-Ca-Si (ZCS)	Wollastonite Ca ₂ ZrSi ₄ O ₁₂	1010° c	Very Opaque, improves whiteness and Control shrinkage
Ca-Ba-Si (CBS)	Celsiana	920° c	Improves translucency, control shrinkage and pyroplasticity
Ca-Zr-Al-Si (CZAS)	Anortite Ca ₂ ZrSi ₄ O ₁₂	1050° c	Very Opaque, improves whiteness and Increase COE.
Ca-Zr-Si-Mg-Al	Anortite Ca ₂ ZrSi ₄ O ₁₂		Increases whiteness moderately, improves body stains colour development

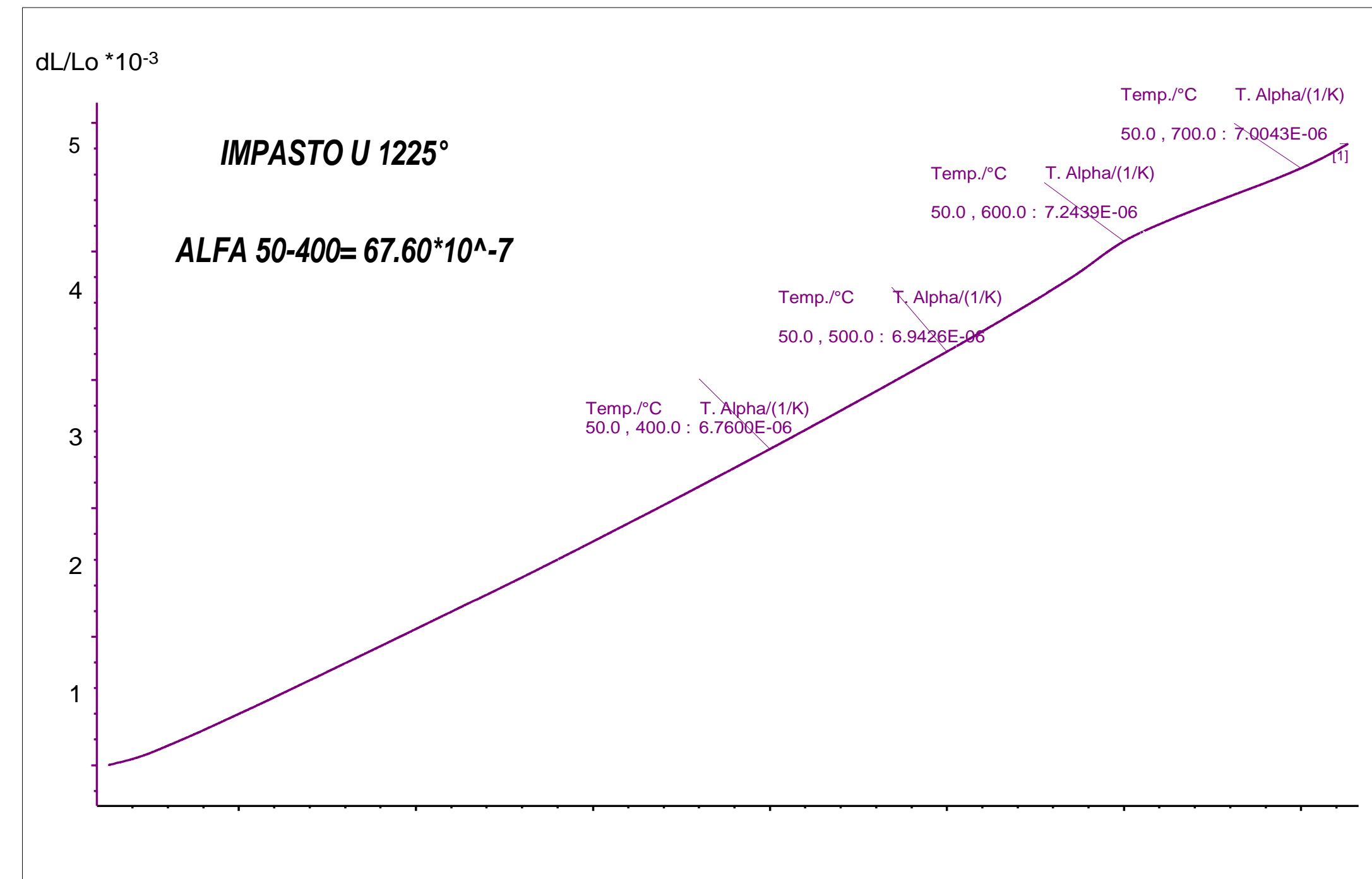


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Technical parameters Hyperwhite Colorobbia body

Parameters	Values
Ceramic slip density g/l	1.6
Ceramic slip viscosity°E	3.2
Grinding residue 63 micron	0,4-0,5%
Atomised powder moisture	6,5-8,0 %
Specific pressure bar	300-350
Density in green g/cc	2040-2050
Density in dried g/cc	1880-1900
Green mechanical resistance *	6-8 kg/cm2
* Without chemical additives. Value increased by 20/35% with chemical additives, without deterioration of the rheological characteristics of the slip.	
Dry mechanical strength * • Without chemical additives.	35-50 kg/cm2
Mechanical resistance of fired product	> 450 kg/cm2
Shrinkage after firing	4-5 %
Water absorption	0.0 - 0.1 %
Coefficient of expansion (50-400 °) / Coefficient of expansion (500-600 °)	66-68 / 72-74
Colorimetric coordinates	L > 93, a – 0.5, b < 3





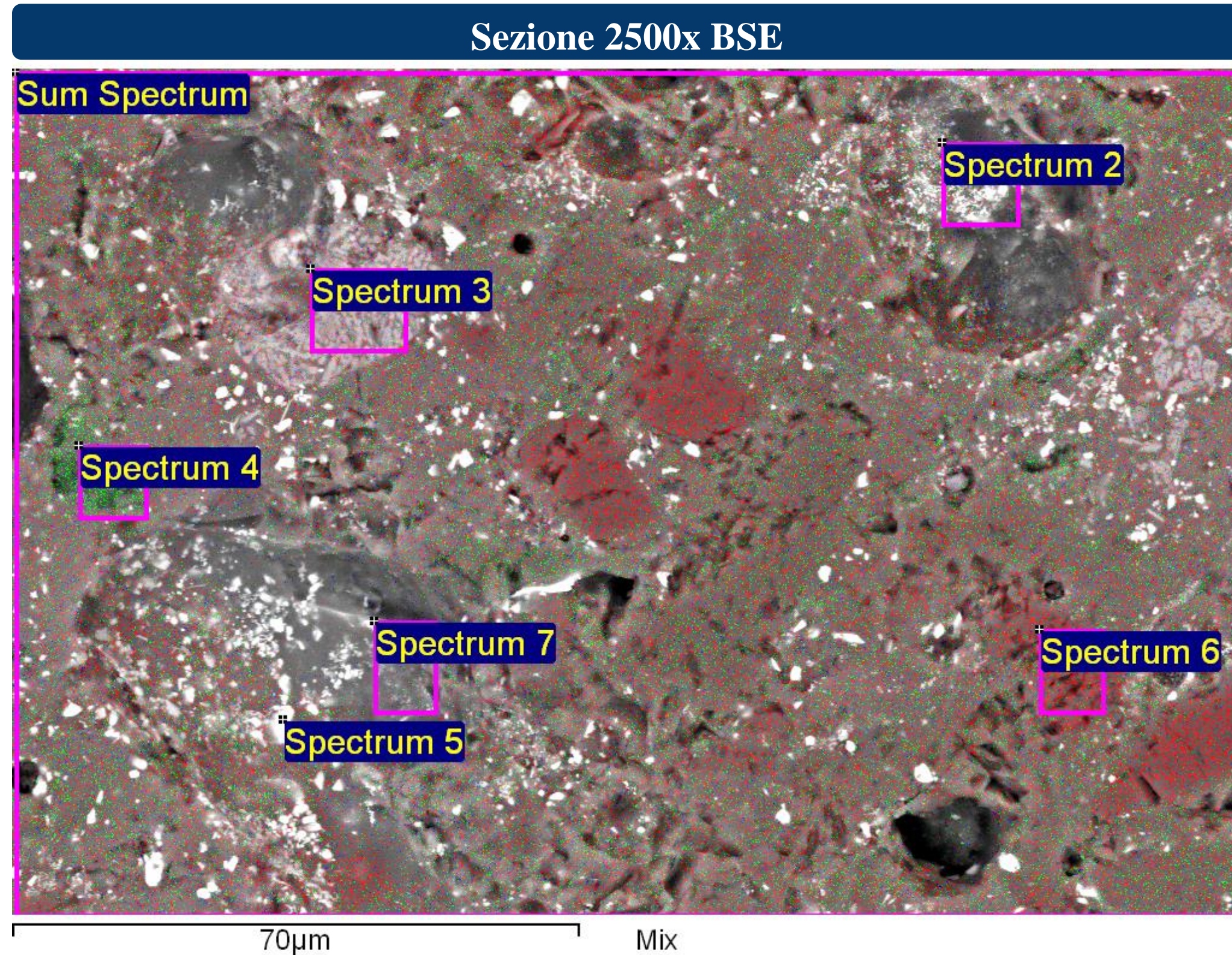
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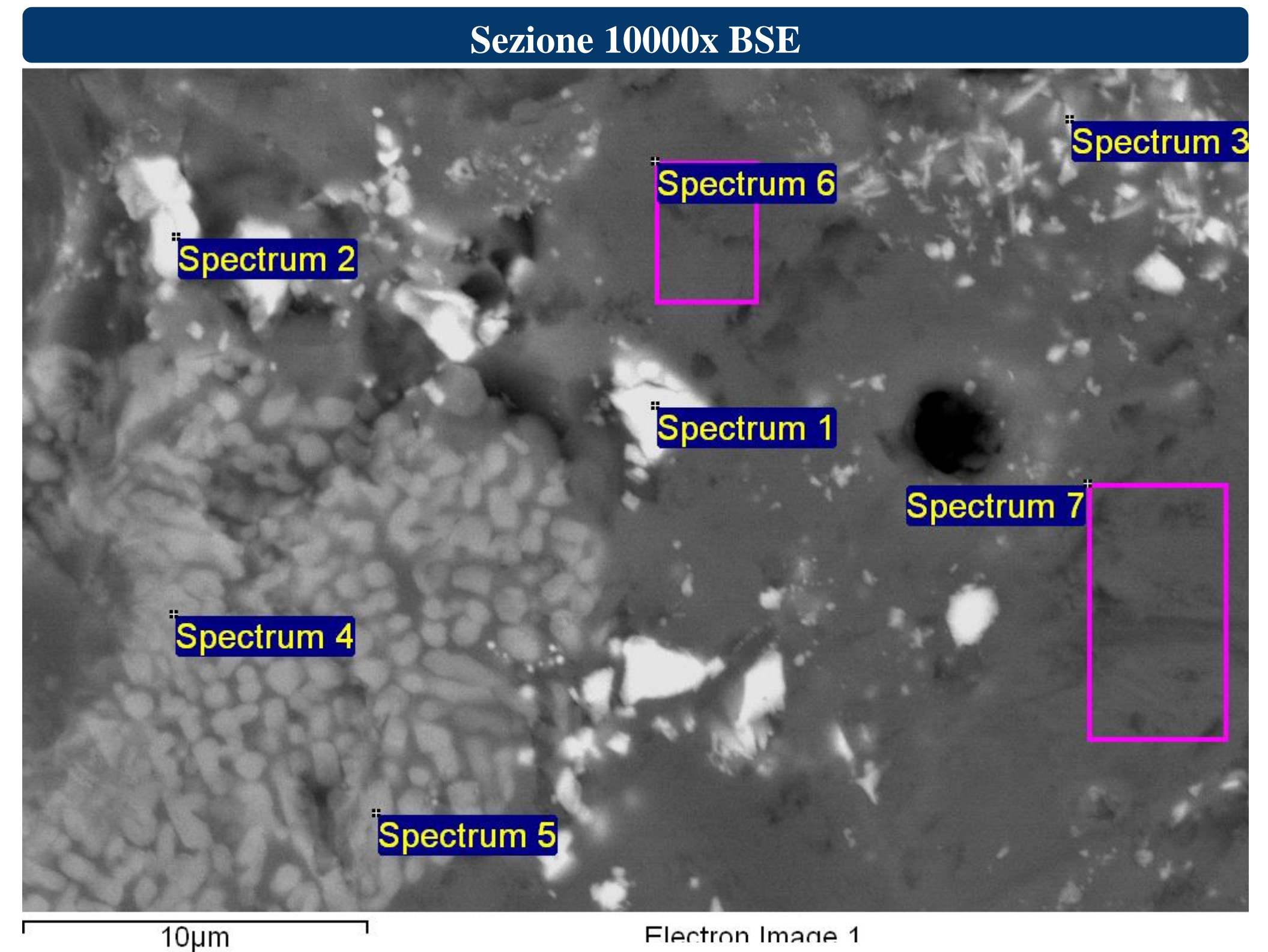
Very white!



SEM on fired tiles



Spectrum	% Na2O	% MgO	% Al2O3	% SiO2	% K2O	% CaO	% ZrO2
Spectrum 3	1.82	1.72	5.13	57.42	1.65	16.50	15.76
Spectrum 4	1.68	3.96	58.88	28.14	0.46	4.81	2.07
Spectrum 6	0.45	0.03	1.77	96.92	0.45	0.18	0.46



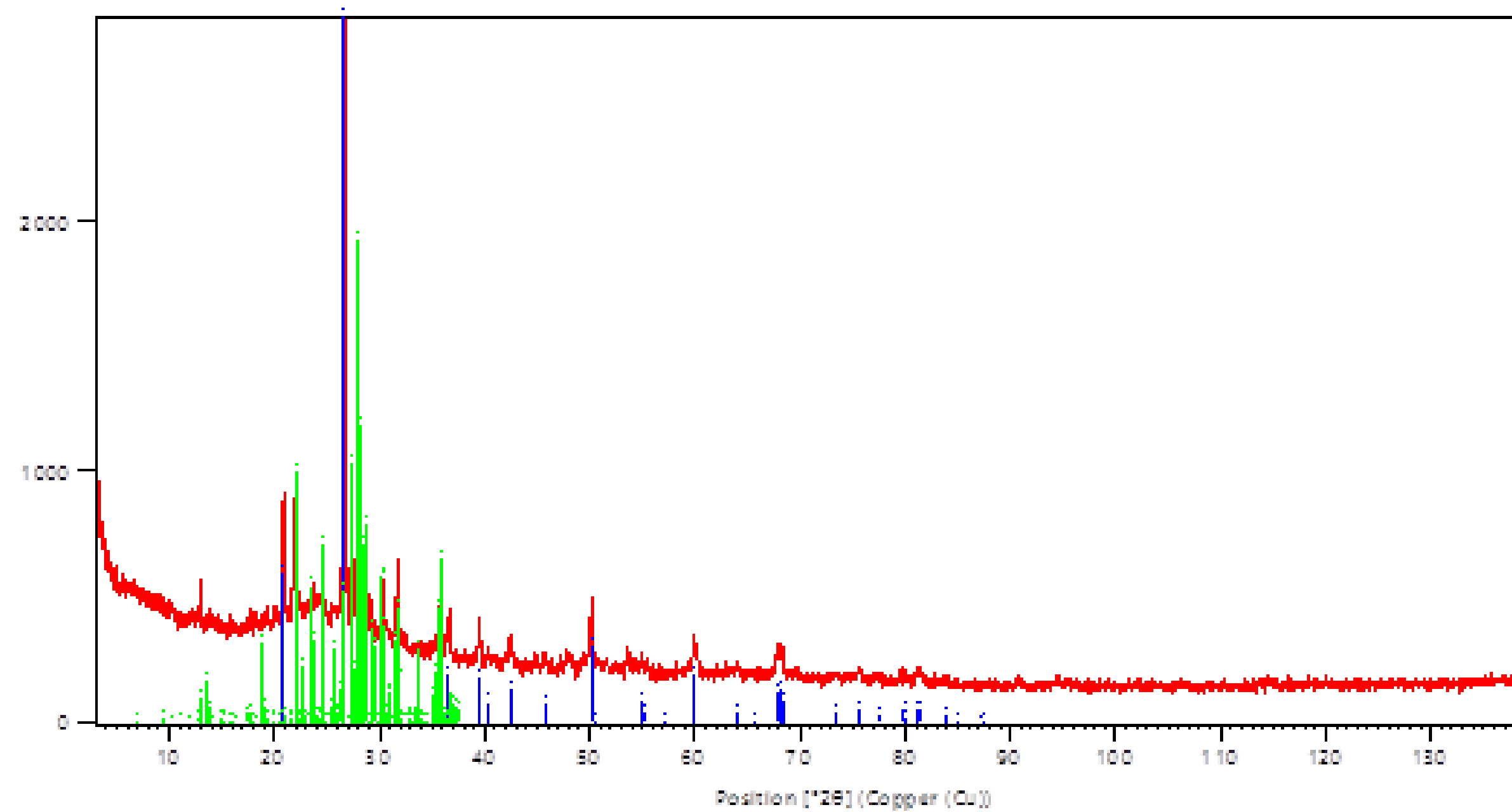
Spectrum	% Na2O	% MgO	% Al2O3	% SiO2	% K2O	% CaO	% ZrO2
Spectrum 4	0.65	4.82	2.04	56.65	0.50	19.43	15.90
Spectrum 5	1.40	0.81	4.28	56.54	0.67	17.29	19.01



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Fired body XRD



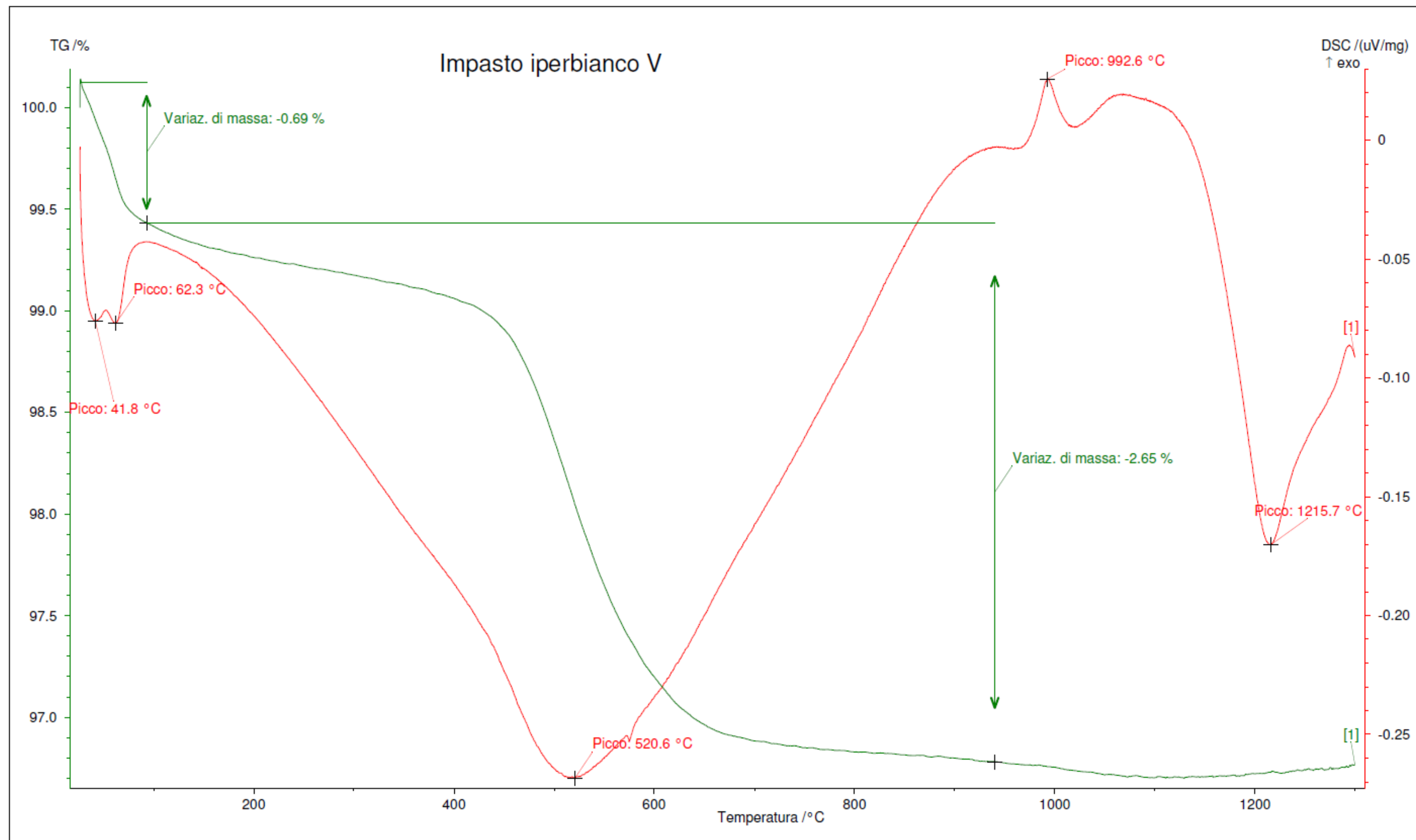
Visible	Ref.Code	Score	Compound Name	Displ.[°2θ]	Scale Fac.	Chem. Formula
Blue	98-004-0906	65	Quartz low	0,000	0,857	O2 Si1
Green	98-004-2012	26	Anorthite	0,000	0,255	Al2 Ca1 O8 Si2



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DTA/TG

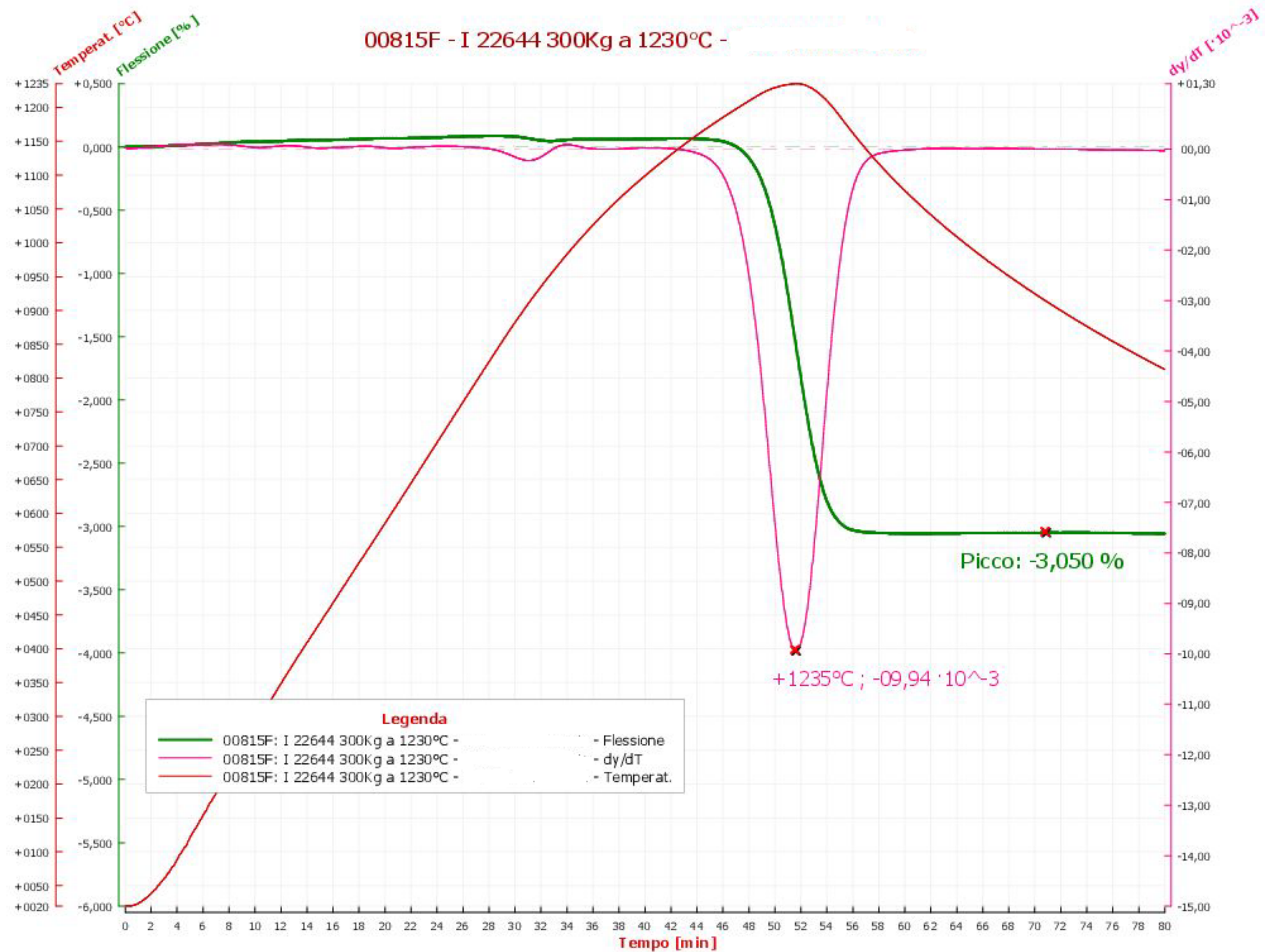




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FLEXIMETRY





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Colorobbia position

- ✓ Colorobbia offers a **wide range of C-frits** with excellent ratio prize/quality and has a **specific team** with and the **Know How** to help the customer in the development and implementation of the special bodies.
- ✓ Offer to customers may have following options:

OFFER	CONDITION
Only Frits	Composition developed by customer
Full composition & Support	Composition developed with Colorobbia materials Support for implementation
Frits, part of composition & Support	Composition developed by Colorobbia on customers r.m. base Support for implementation



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Colorobbia position

Unique selling points

- Wide range of C-frits developed and supplied more than 20 years ago.
- Colorobbia has been a pioneer in our business about this technology.
- Frits being supplied and used by Key manufacturers.
- Synergy with Industrie Bitossi; warranty for quality and availability of low radioactivity Zr.
- Demonstrated experience.
- Dedicated technical team with experience in body compositions.
- Possibility to offer Know – How.

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Thanks
for your attention