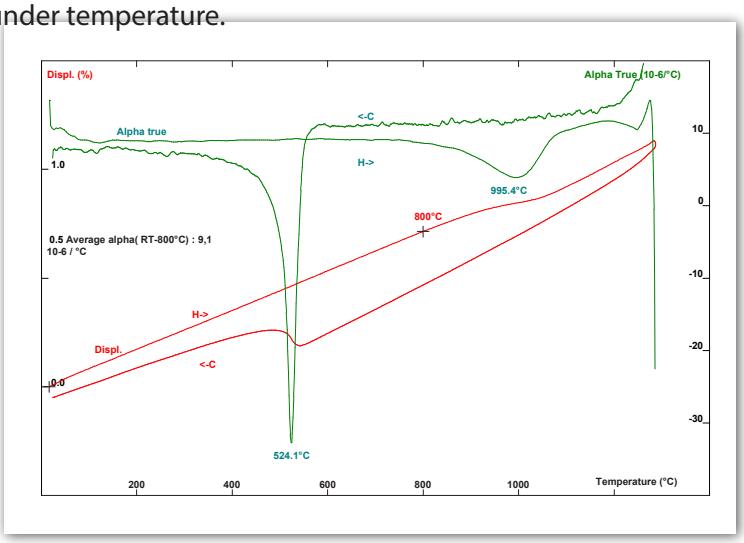
Thermal expansion of Zirconia

INTRODUCTION

Under the effects of increasing temperature any material will expand. This can lead to significant changes in dimensions of ceramic parts when heated. The Coefficient of Thermal Expansion (CTE) is a thermophysical property which characterizes the ability of a material to expand under the effect of temperature elevation. It tells you how much the ceramic will remain dimensionally stable under temperature.

The thermal expansion difference between parts that are in contact in a complex structure may develop internal stresses and stress concentrations, leading to premature failure to occur. Hence, CTE is important for quality and functioning of any structure that may be heated during its cycle life.



EXPERIMENT

Sample : Zirconia.
Sample length : 19.90 mm.
Probe : alumina, flat ended.
Gas : helium.
Heating from 20°C up to 1300°C at 1.5 K/min.
Cooling from 1300°C down to 20°C at 0.5 K/min.
The same experiment without sample was also carried out (blank).

RESULTS AND CONCLUSION

During the heating the average coefficient of expansion between 20°C and 800°C is $9.1.10^{-6}$/°C. This result was obtain after applying the standard correction of the probe and sample holder tube expansions, and of the instrumental drift.

INSTRUMENT

THEMYS TMA

- PRESERVATION OF SAMPLES due to low load vertical TMA system.
- ULTRA-HIGH TEMPERATURE CAPABILITY ***to 2400°C*** with a single furnace.
- MODULAR ADAPTIONS ALLOWING TGA only, DTA only, TG-DTA, and TMA up to 2400°C, DSC only and TG-DSC up to 1600°C all in one instrument.
- EXTERNAL COUPLING CAPABILITY designed for evolved gas analyzers (FTIR, MS, GCMS, MSFTIR, or FTIR-GCMS)

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