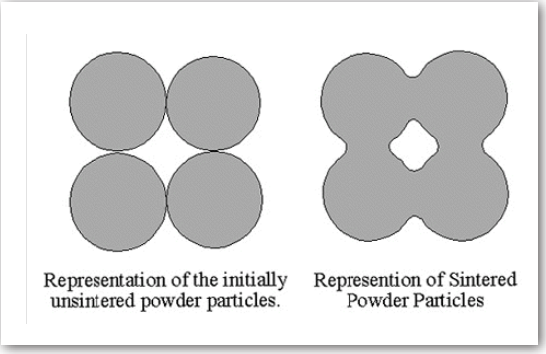
Sintering of Silicon Carbide (SiC

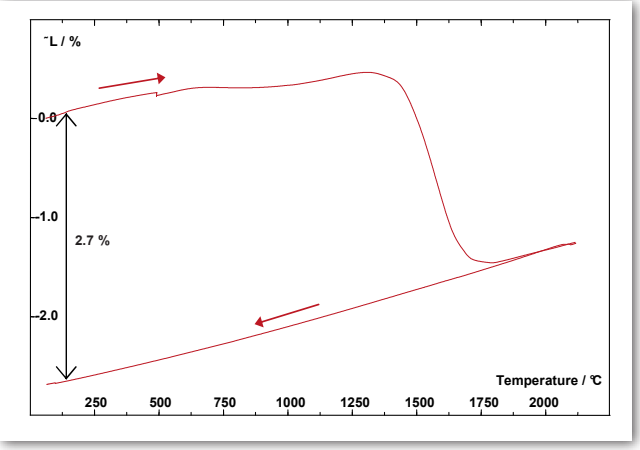
INTRODUCTION

Sintering is a process for making objects from powder, increasing the adhesion between particles as they are heated. It is used with ceramic powders and in powder metallurgy.
For example, the most convenient method for producing dense SiC is pressureless sintering. Due to the strongly covalent character of the Si-C chemical bond and hence slow diffusion kinetics, the addition of sintering enhancers is necessary, if a high degree of densification is required. The most frequently used enhancer combinations, B+C or Al+C, allow for sintered densities above ≥ 97% of the theoretical value.



EXPERIMENT

The sample was a precompacted α-SiC powder cube wih the following dimensions:.
9 mm x 9 mm x 9 mm
It was analyzed under argon and the applied load was 5g
The following temperature program was used:
• 20°C up to 480°C at 10 K/min and maintained during 3 hours at this temperature.
• 480°C up to 2200°C at 15 K/min .
• 2200°C down to ambient temperature at 15 K/min. The experiment curve was corrected from a blank carried without sample and in the same experimental conditions.



RESULTS AND CONCLUSION

The experimental curve presents a global expansion between ambient and 1310°C.
Above 1310°C, shrinkage is noticed : it is due to the sintering of SiC. And it is completed at 1815°C.
Above 1815°C, the expansion of SiC is observed.
During cooling, a shrinkage of sintering SiC is observed. The global shrinkage after cooling back to ambient is 2,7%.

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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