

## EXPLOITATION OF INDUSTRIAL APPLICATION OF FLASH TO SINTER CERAMICS

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FLASH is an electric field-assisted sintering technique recently proposed to densify materials in a more sustainable, energy reductive and cost-effective way than conventional sintering (CS). FLASH sintering promotes the densification of materials by using a combination of temperature and electric field. The use of electric field allows a decrease in the sintering temperature, and as important as well, in the sintering cycle duration. The advantages of FLASH, when compared with other field-assisted techniques, are: low investment, no need for specific atmosphere and dies, and specimen shape versatility.

Consequently, there is an industrial interest on the implementation of sustainable alternative sintering techniques, as FLASH. However practical questions arise as, among many: is this reduction, in addition to the power source consumption, enough to make FLASH energetically favorable from an industrial processing point of view? Most of the authors argue yes, but comparative studies with industrial CS are yet missing. In this work, and as a result of collaborations with two Portuguese ceramic companies, we present a systematic study on the energetic savings of FLASH sintering when applied to two different industrial ceramic products processing: (i) Rapox brown, a manganese-doped alumina used in insulating and wear resistance applications, and (ii) floor tiles used in construction.

An experimental approximation was considered, in which the FLASH temperature for each material was studied. As a mean to calculate possible energy savings, the FLASH thermal cycle was extrapolated and compared with CS cycle. The electric power necessary to FLASH sinter each material was calculated (normalized to 1 kg of material), and a global energy consumption study was performed. Considering the FLASH temperature of 1000 °C for Rapox brown, the reduction in the cycle time is huge, and can be seen in fig. 1.

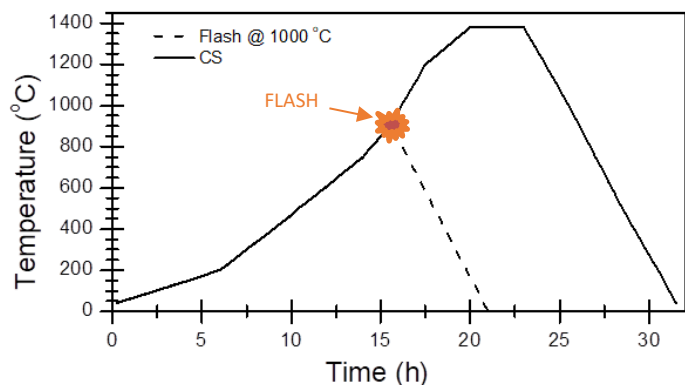


Figure 1 – Temperature vs time comparison of FLASH and conventional sintered Rapox-brown