Investigation of a Sintering Phenomena through Master Sintering Curve Based on Python Software

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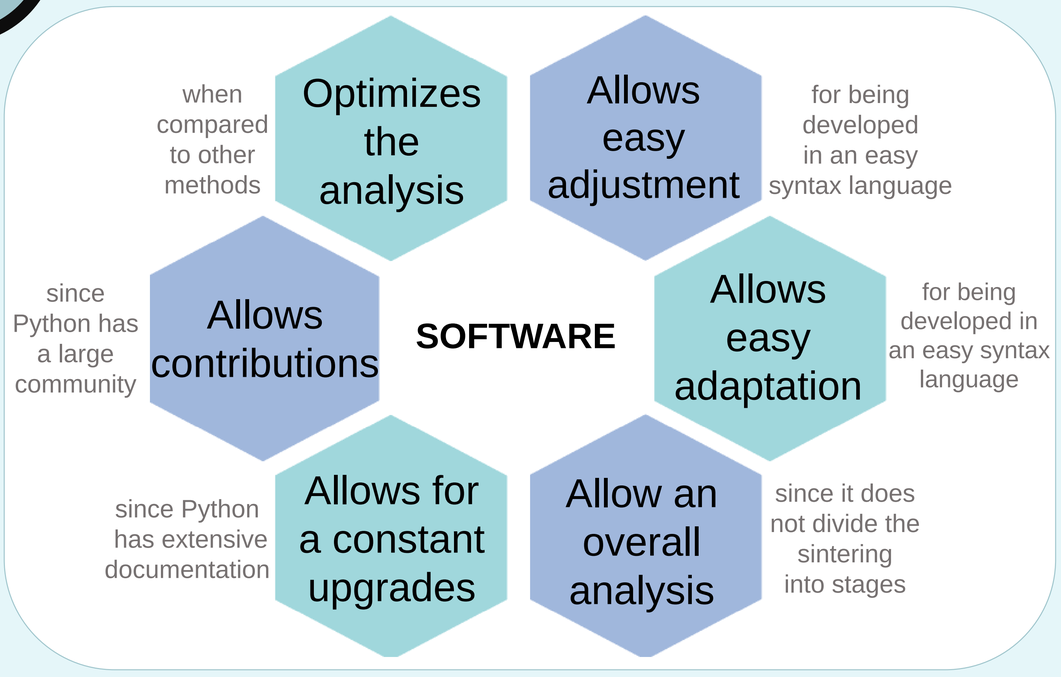
1 INTRODUCTION

1. Sintering, the key step of the ceramic processing, changes the microstructure of material
2. MSC is a graphical way, based on experimental data, to analyze sintering
3. MSC describes the global sintering process, without identifying stages
4. Collected data of time, temperature, shrinkage and activation energy
5. Most programs that create MSC are of unclear languages
6. $$\theta(t,T(t)) = \frac{k}{\gamma\Omega\delta D_0}\int_{\rho_0}^{\rho}\frac{(G(\rho))^n}{3\rho\Gamma(\rho)}d\rho = \int_0^t \frac{1}{T}\exp\left(\frac{-Q}{RT}\right)dt$$

2 EXPERIMENTAL PROCEDURE

- Literature search on sintering and MSC
- Study for numerical analysis using Python
- Numerical study of sintering modeling
- Developed the Python software
- Create and validate MSC to understand sintering

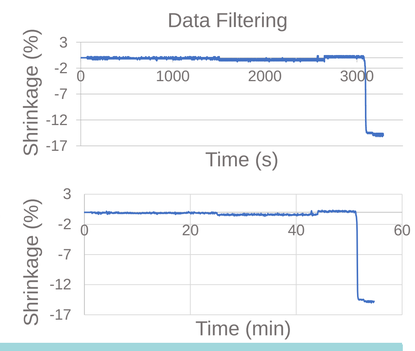
3 HIGHLIGHTS



4 RESULTS AND DISCUSSION

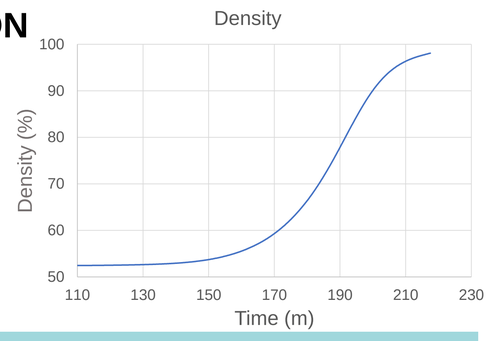
1 DATA FILTERING

Taking time as a reference, average shrinkage and temperature values are found, reducing the amount of data



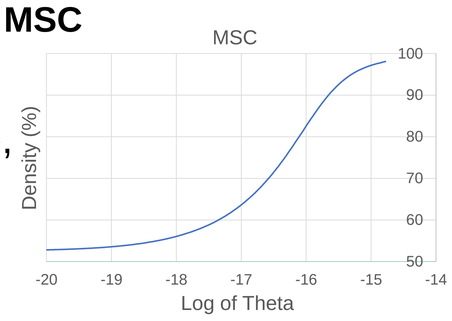
2 DATA CONVERSION

Shrinkage data are converted to density data through a theoretical equation



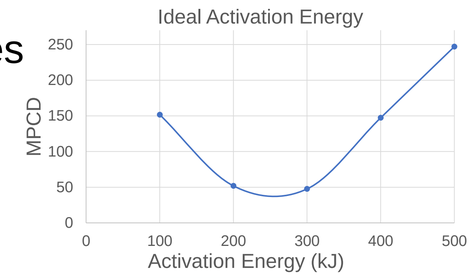
3 CONSTRUCTION OF MSC

Inserting data tables with data of time, temperature, density and activation energy the MSC is built



4 FIND THE ACTIVATION ENERGY

Inserting two data tables of the same material is possible find the ideal activation energy



The process described above is optimized due to the existence of the software

Results obtained were compared with the theory and were considered satisfactory

Improvements in ceramic materials can occur by studying the MSC and evolution of density

5 CONCLUSION

- The construction of the Python Software allows an optimized and detailed analysis of sintering, collaborating with the advancement of ceramic materials

6 ACKNOWLEDGEMENTS

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