Title: **Field-assisted sintering: flash sintering**
Student: Lluís Vilella Piqué
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Supervisor/s: Dra. Lourdes Mestres Vila
Departament of Química Inorgànica i Química Orgànica
Secció de Química Inorgànica

Flash sintering is a novel technique used for ceramics densification by means of heating and applying an electric field. Its advantages over conventional sintering have been discussed in the present work, amongst which, the following advantages are displayed: energy savings, shorter sintering times and preparation of ceramic materials with complex compositions by controlling abnormal grain growth and stoichiometry, as the loss of volatile compounds is avoided.

The setup for flash sintering has been constantly developing since the introduction of the technique and sophisticated setups have been designed in order to collect all the required data during the same analysis.

Moreover, the electrical response has been reviewed during this process where power, applied field and current are controlled.

Flash sintering mechanisms have also been discussed as various authors proposed different mechanisms to explain this phenomenon such as Joule heating, nucleation of Frenkel pairs and electrochemical reduction.

Furthermore, an extensive list of parameters controlling flash sintering have been studied and its optimization have been discussed; for instance, applied electric field, current density, initial particle size, green density, addition of sintering aids and the atmosphere.

In this work, a comprehensive study of different prediction models have been made. These models have been created to predict sample temperature from furnace temperature, and onset temperature depending on the applied field.

The last bibliographic section exhibit new materials sintering by flash sintering. Dwelling time and temperature are compared with the conventional sintering of the same materials. Useful information can be extracted from this analysis in order to prepare dense ceramics as a few studies about materials' properties show similar results to conventionally sintered materials. However, flash sintering have been shown to substantially reduce onset temperatures and dwelling times.

Concerning the experimental part, conventional sintering and flash sintering experiments of a commercial sample of $BaTiO_3$ have been performed but relative densities and characterization methods have not been carried out due to the pandemic. Regarding the study of a previously prepared $Nd_2Zr_2O_7$, conventional sintering was performed and the resulting relative density was calculated. X-ray diffraction analysis was carried out and the resulting diffractometer was analyzed. Impedance spectroscopy was carried out, but results were not analyzed as a full set of measurements was not performed.

Keywords: flash sintering, ceramic materials, pyrochlore, X-ray diffraction.