Thesis writing

Abstract - Engineering example

Example: abstract of a thesis

This research developed a hybrid heating process which can sinter yttria zirconia ceramics to nearly 100% of their theoretical density in a short time. Following optimisation of the process, a detailed comparison of the properties and microstructures of conventionally sintered and microwave sintered samples of 3 mol% and 8 mol% yttria zirconia was performed. Identical thermal profiles were used for both types of heating. For both materials, microwave heating was found to enhance the densification processes which occur during constant rate heating.	*topic and focus of research* *methodology* *overall results*
The 3 mol% yttria zirconia material exhibited a shift in the grain size/density relationship which favours densification, resulting in higher density samples with smaller grain sizes at densities below 96% of theoretical density. At higher densities, significant grain growth occurs. For the 8 mol% yttria zirconia material, the grain size 1 density relationship remained unchanged. Differences in the response of the two materials are attributed to the differences in the activation energy for grain growth, and in grain boundary mobility. Modulus of rupture and toughness of both microwave and conventionally sintered samples were similar. Results for constant rate heating for microwaves and conventional heating (temperature is increasing at a constant rate - in this case either 2°C or 20°C per minute - to a set maximum temp, then heating stopped).	*results for 3 mol%* *results for 8 mol%* *interpretation of results*
Following isothermal heating at 1300°C, microwave heated samples were found to be significantly more dense than conventionally heated samples. The lower temperature also restricted grain growth once densification was approaching completion. Results for constant temperature heating for microwaves and conventional heating (samples held at a set temp - 1300°C - for set period).	*further detail – results of different methods compared*
When aged at 1500°C, grain growth in the 3 mol% yttria-zirconia was also found to be accelerated in the electromagnetic field, with exaggerated grain growth being observed. The larger grain size was reflected in an increase in transformability of the tetragonal phase. Grain growth in 8 mol% yttria zirconia was not significantly affected by microwave heating over the time period studied.	*results for 3 mol% at 1500C* *results for 8 mol% at at 1500 C*
These findings have significant implications for the commercial application of microwave sintering. The best way to take advantage of the benefits of microwave sintering for yttria zirconia ceramics would appear to be incorporation of dwell periods at temperatures in the 1200 - 1350°C range in the sintering program.	*significance of results*

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