CORRELATION BETWEEN THE MICROSTRUCTURE OF ALUMINA SINTERED BODIES WITH THEIR RHEOLOGICAL PARAMETERS

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Inter-particle interactions in highly loaded ceramic slurries play a critical role in the forming of ceramic bodies. These interactions at a fixed solids loading depend on the particle size, and/or use of additives that provide steric hindrance. The knowledge of the rheological behaviour or the way in which the multicomponent systems (slurries) flow or get deformed under stress, the structure of which, usually complex, is often not well characterized, results to be of a great importance in the ceramic industry.

In this work, alumina SASOL SPA-05, with an average size of 0.5 microns has been used. In order to reduce the average size of the particles, a separation process, based on praising, has been carried out, leading to a reduction in the average grain size of the alumina particles to 200 nm.

On both systems, rheology measurements have been done in order to study the evolution of the viscosity as a function of the solid content and the amount of dispersant (Dolapix CE-64 [1]).The main aim of this study is to achieve a viscosity around 180-200 cP with the highest percentage of solids, which will further allow obtaining a high density of the green body. A first study was done changing the percentage of solids (75-83 wt %) and keeping constant the amount of the dispersant agent (0.5 w%). The results are shown in Fig. 1. According to the previous results, 83 wt% solids has been chosen to do a second study, changing the percentage of the dispersant agent. These results are shown in Fig. 2. After slip casting on an alumina mold, the microstructure of the system was studied by mercury porosimetry and SEM.

The relevance of controlling the microstructural characteristics in the green body has been further manifested after sintering (in air atmosphere, in this work). It will be discussed how the initial packing (in the green body) strongly modifies the microstructure of the sintered body and, therefore, its mechanical properties.

References

[1] Athenea Tsetsekou, Christos Agrafiotis, Aggelos Millias. Optimization of the rheological properties of alumina slurries for ceramic processing applications. Part I: Slip-casting. Journal of the European Ceramic Society, **21** (2001) 363-373.

Figures:

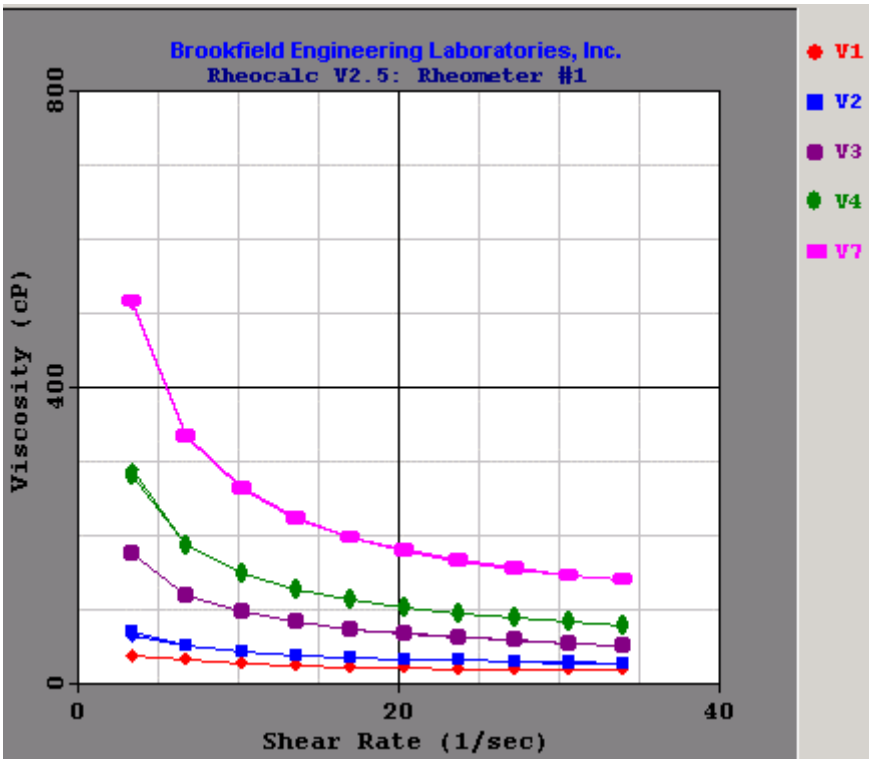

Fig. 1. Viscosity as a function of the solid content at 0.5% of Dolapix.

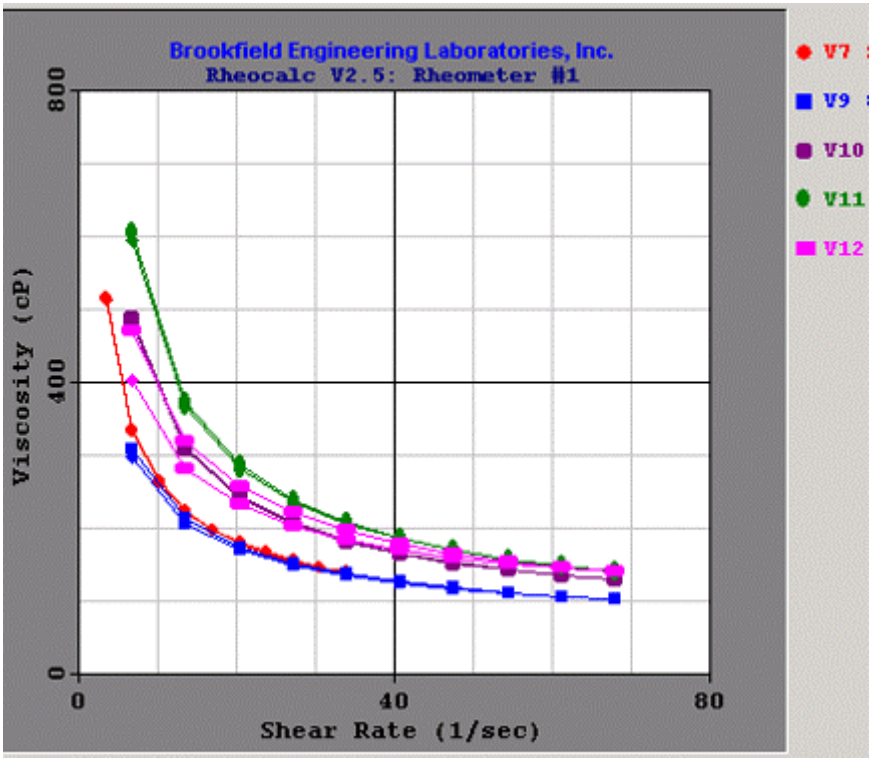

Fig. 2. Viscosity as a function of the additive percentage at 83 wt% solid content.