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Comparative study on the sintered properties of Al_2O_3 produced by Pressure slip casting and Conventional slip casting

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ABSTRCT

Pressure slip casting is a technique known in table ware industry for producing near net-shaped green bodies with shorter processing cycles and very good consistency. The preparation and control of stable, well-dispersed ceramic slips is considered as key parameter to achieve the desired properties in the green bodies. Pressure slip casting moulds are made of polymeric resin with highly controlled and well distributed porosity to ensure desired permeability of water and air which in turn results in homogeneous thickness built up. Of late, the possibility of utilizing the pressure slip casting technique for making advanced ceramic components started being looked at to exploit the advantages associated with it such as the higher green densities, near net shaping, consistency and the productivity.

Present work has been undertaken with a focus on studying the shaping of Al_2O_3 by pressure slip casting process and understanding the results in comparison with that of the conventional slip casting method. For this purpose, both the polymer based and POP moulds were fabricated. Slips of varying solid loadings were prepared using two grades of alpha alumina powders from the same source with average particle sizes, 1µm & 7µm and used in the experiments. The optimization of slip/slurry has been done with solid loadings varying from 65% to 80% along with rheological behavior of shear thinning which is required in pressure slip casting for better consolidation. The green densities of the discs were calculated after drying and before subjecting them for sintered schedule with the peak temperature of 1600^{o}C.It has been observed that the pressure slip casting technique gives higher green densities of ≥60% when compared with 55±2% obtained with conventional casting method. Sintered densities were found to be in the range of 98-99% indicating the lower porosities. The results of the physico-chemical, thermal, microstructural and mechanical characterization would be discussed in detail.

Key words: Slip solid loading, Rheological behavior, Slip holding time, Applying pressure and Thickness built up.