

Fabrication of Clay Based Ceramics for Engineering Applications

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This paper describes some preliminary work concerned with the fabrication of clay based ceramics with suitable additives to obtain the properties required for engineering applications. In order to achieve this, the conventional porcelain body composition was modified by additions of oxides such as Y_2O_3 , ZrO_2 , MgO , MnO , etc. to promote strong crystal structures and better bonding. Rectangular bar samples were prepared by slip casting as well as by uniaxial powder pressing under a pressure of 32 MPa and sintered at different temperatures close to $1200^{\circ}C$.

The sintered samples were tested for their bend strength and wear resistance. The structural characterization of the samples was performed by X-ray diffraction (XRD). The bending tests revealed that bend strength varies significantly with different compositions and different maturing temperatures. Y_2O_3 and ZrO_2 added samples showed very encouraging results in relation to the bend strength. The bend strength of these two ceramics was about 30% higher than that for the conventional clay based ceramics.

The XRD analysis showed that the ZrO_2 and Y_2O_3 doped samples contained more crystalline phases, thus justifying their strength. The high bending strength of ZrO_2 added samples could also be attributed to the fact that those samples contained higher amounts of Mullite phases than their conventional counterparts. However, the wear resistance of these ceramics showed somewhat similar values. In conclusion it can be stated that this study indicates the possibility of developing cheap clay based ceramics as high technological ceramics by careful selection of suitable additives and sintering procedures.