ABSTRACT

Rheological and Slip-Casting Properties of Indigenous Clay-based Slurries

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Industry prospers when there is product demand, quality is adhered, production is maximised and costs are minimised. The manufacture of industrial ceramics is currently underdeveloped in Trinidad and Tobago, predominantly due to high raw materials costs and product quality variability. Much revenue is lost to the importation of the bulk of the raw materials, like clay and clay casting slips, required for these industries. With renewed interest in clay-based products from developing countries, the relatively low cost of fuel and its significant clay resources, Trinidad has the potential to generate new income from this regenerated market.

This study systematically investigated three indigenous clays namely the Valencia clay, Carlsen Field clay and Longdenville clay. They were chosen for their distinctly different levels of plasticity, to determine their potential as reliable components in casting slips. One of the clays was found to be unstable in a slip because of its low plasticity and high coarse particle content. As a result, this clay underwent simple benefaction techniques.

Favourable casting slip properties were obtained for slips made using either 10 % Longdeville clay added to sedimented Valencia clay or equal parts Carlsen Field and sedimented Valencia clay. The use of sedimented Valencia

clay in place of its unrefined form, improved fired modulus of rupture values by 330-400 % and reduced apparent porosity from ~ 20 % to <1 %. The improved properties mean that these combinations have potential for use in the ceramic industry.

An eruption of the Soufrière Hills Volcano in Montserrat in 1995 prompted the addition of volcanic ash to the study. Two forms of ash were discovered, one consisted of cristobalite and the other was composed predominantly of feldspar minerals. In its feldsparic form, the presence of volcanic ash in selected slurries promoted the formation of mullite, the main structure of commercial, high quality porcelain when fired at 1200 °C.

Keywords: Trinidad, ceramic, clay, casting slip, benefaction modulus of rupture, volcanic ash, mullite, porcelain.