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**APPLICATIONS OF RED CLAYS OF SRI LANKA FOR HIGH
QUALITY CERAMIC PRODUCTS**

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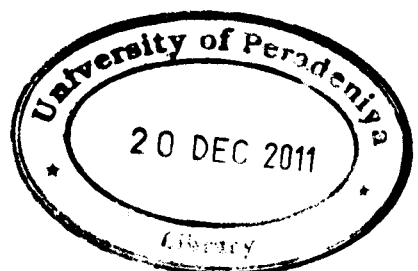
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APPLICATIONS OF RED CLAYS OF SRI LANKA FOR HIGH QUALITY CERAMIC PRODUCTS

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Demand for raw materials such as ball clay and china clay has been extremely increased in recent past with the application of ceramic materials for building and construction purposes such as floor and wall tiles. Consequently, available ball clay and china clay deposits are rapidly being exhausted. Red clay-based ceramics such as bricks, roof tiles, pottery and ornamental ware are being manufactured in Sri Lanka for a long time. Poor understanding on red clay and its product has resulted in manufacturing low quality products. The diversification of the product range has not happened throughout the last few decades due to lack of research and development on red clay-based ceramics. Present study was focused to identify the potential of red clay in the production of high quality low cost ceramic products.

The mineralogical composition and textural variation of red clays collected from two main climatic zones of Sri Lanka were identified. The effect of mineralogical composition and textural variation of red clays on the quality of the products was investigated. The potential of incorporation of commonly available granite as a fluxing raw material for red clay ceramics was then studied. Also the feasibility of incorporation of a high alkali-borax frit for reducing the vitrification temperature of red clay-based products was determined. For diversifying the range of products, the feasibility of developing an efficient casting slip using red clays and fabricating of compatible glazes for these products were studied.

The results showed that clay samples of dry zone are rich in illite group clay with a high amount of alkaline oxides (Na_2O and K_2O) and Fe_2O_3 . Samples from the wet zone were rich in the kaolinite group clays with a low amount of alkaline oxides and Fe_2O_3 . The dry zone clays showed a lower refractoriness compared to the wet zone clays that are characterized by good vitrification and higher strength even at low firing temperatures.

When the amount of Na_2O , K_2O and Fe_2O_3 in the clay-silt fraction is about 21 wt.%, a best quality product (flexural strength up to 26.82 MPa and water absorption < 6.51%) can be obtained. The composition raw materials such as clay-silt and sand are 80 wt.% and 20 wt.% respectively and the burning temperature was at 1000 °C. If the amount of Na_2O , K_2O and Fe_2O_3 is low, a 90 wt.% of clay-silt fraction must be added to obtain the optimum quality at 1000 °C.

The results showed that microcline, anorthite, biotite and hornblende of granite act as fluxing mineral-materials for the body composition of red clay products. A product having higher flexural strength (72.48 MPa) and bulk density (2.59 g/cm^3) and less water absorption (< 0.11 %) can be fabricated using granite powder. The body composition of the best product is 60 wt. % of clay-silt, 10 wt. % of quartz and 30 wt.% of granite. The incorporation of 10 wt.% of frit into above composition resulted in reduction of firing temperature from 1100 °C to 1025 °C. However, the strength of the final product was reduced from 72.48 to 49.98 MPa.

A casting slip having a good casting rate and casting properties can be prepared using locally available red clays. However, china clay should be added to improve the casting rate of the slip. Present study revealed that the transparent or stain fritted glazes matured at 1100 °C can be used to enhance the quality of red clay products.

Based on the results obtained from the study, it can be suggested that red clay deposits available in Sri Lanka can be utilized to fabricate high quality ceramic products such as tiles, cookware items and ornamental wares.