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Comparison study of mechanical and chemical properties of ancient and modern clay pots

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In this study, the ancient clay pottery samples from archaeological site *Devalapola, Minuwangoda*, Sri Lanka (3000 years, radiocarbon age) which were found by the Department of Archaeology, University of Kelaniya, were collected and compared their physical properties with modern clay pottery samples. Also to analyze the mineralogical components and the compositions, the Scanning Electron Microscopy (SEM) coupled with the Energy Dispersive X-Ray spectroscopy (EDX) analysis were performed on the both ancient and modern clay pot samples on both side and top surfaces of them. The firing clay objects is an irreversible process, which produces ceramic materials characterized by new chemical-mineralogical composition and different physical and microstructural features. Physical properties of the shards such as pottery density and water absorption capacity were analyzed. There was no significant difference in the pottery density. The values for the water absorption of the ancient clay pot samples have a wider range than the modern clay pot samples. According to the SEM results, the grain sizes of the modern clay pot samples are comparatively larger than the ancient clay pot samples. The grain sizes of the ceramic indicate the open porosity of the matrix. Based on the SEM-EDX results, SiO₂ and Al₂O₃ were the major components of the both ancient and modern clay pot samples while CaCO₃, MgO, MAD-10-Feldspar, CaSO₃, Ti, and Fe are present in trace amounts. Further albite, FeS₂ and KCl were only present in the modern clay pot samples. By analyzing the EDX results it can be concluded that when the production of the ancient potteries was happening, the furnace atmosphere was filled with more CO₂ and the firing temperature of the ancient clay pot samples at the production was around 850 - 900^oC.

Keywords: Pottery density, SEM-EDX, water absorption capacity