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Variation with Depth of Physico-Chemical, Mineralogical and Physical Properties of Overburden over Gneiss Basement Complex in Minna Metropolis, North Central Nigeria

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Abstract : Soil engineers pay very little or no attention to variation in the mineralogical and consequently, the geotechnical properties of overburden with depth on basement complexes, a situation which can lead to sudden failure of civil engineering structures. Soil samples collected at depths ranging from 0.5m to 4.0m at 0.5m intervals, from a trial pit dogged manually to depth of 4.0m on an overburden over gneiss basement complex, was evaluated for physico-chemical, mineralogical and physical properties. This is to determine the variation of these properties with depth within the profile of the strata. Results showed that sodium amphibolite and feldspar, which are both primary minerals dominate the overall profile of the overburden. Carbon which dominates the lower profile of the strata was observed to alter to gregorite at upper section of the profile. Organic matter contents and cation exchange capacity reduces with increase in depth while lost on ignition and pH were relatively constant with depth. The index properties, as well as natural moisture contents, increases from 0.5m to between 1.0m to 1.5m depth after which the values reduced to constant values at 3.0m depth. The grain size analysis shows high composition of sand sized particles with silts of low to non-plasticity. The maximum dry density (MDD) values are generally relatively high and increases from 2.262g/cm^3 at 0.5m depth to 2.410g/cm^3 at 4.0m depth while the optimum moisture content (OMC) reduced from 9.8% at 0.5m depth to 6.7% at 4.0m depth.

Keywords : Gneiss basement complex, mineralogical properties, North Central Nigeria, physico-chemical properties, physical properties, overburden soil
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