World Academy of Science, Engineering and Technology
International Journal of Structural and Construction Engineering
Vol:10, No:07, 2016

Physicochemistry of Pozzolanic Stabilization of a Class A-2-7 Lateritic Soil

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Abstract : The paper examines the mechanism of pozzolan-soil reactions, using a recent study on the chemical stabilization of a Class A-2-7 (3) lateritic soil, with corn cob ash (CCA) as case study. The objectives are to establish a nexus between cation exchange capacity of the soil, the alkaline forming compounds in CCA and percentage CCA addition to soil beyond which no more improvement in strength properties can be achieved; and to propose feasible chemical reactions to explain the chemical stabilization of the lateritic soil with CCA alone. The lateritic soil, as well as CCA of pozzolanic quality Class C were separately analysed for their metallic oxide composition using the X-Ray Fluorescence technique. The cation exchange capacity (CEC) of the soil and the CCA were computed theoretically using the percentage composition of the base cations Ca²⁺, Mg²⁺ K⁺ and Na²⁺ as 1.48 meq/100 g and 61.67 meq/100 g respectively, thus indicating a ratio of 0.024 or 2.4%. This figure, taken as the theoretical amount required to just fill up the exchangeable sites of the clay molecules, compares well with the laboratory observation of 1.5% for the optimum level of CCA addition to lateritic soil. The paper went on to present chemical reaction equations between the alkaline earth metals in the CCA and the silica in the lateritic soil to form silicates, thereby proposing an extension of the theory of mechanism of soil stabilization to cover chemical stabilization with pozzolanic ash only. The paper concluded by recommending further research on the molecular structure of soils stabilized with pozzolanic waste ash alone, with a view to confirming the chemical equations advanced in the study.

Keywords : cation exchange capacity, corn cob ash, lateritic soil, soil stabilization
Conference Title : ICSECM 2016 : International Conference on Structural Engineering, Construction and Management
Conference Location : Montreal, Canada
Conference Dates : July 14-15, 2016