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Structural analysis of consolidation settlement behaviour of soil treated with alternative cementing materials for foundation purposes

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Highlights

- Quarry dust (QD), crushed waste ceramics (CWC), and palm bunch ash (PBA) were obtained
- They were characterized to determine their aluminosilicate content and pozzolanic properties
- Test soil sample was studied to determine the preliminary properties
- CWC and PBA base GPC were synthesized for use as cementitious geoplymer additives
- The effect of QD, CWC and PBA on consolidation settlement of the treated soil was studied
- The effect of CWC base GPC on consolidation settlement of the treated soil was studied
- And the effect of PBA base GPC on consolidation settlement of the treated soil was also studied

Abstract

The structural analysis of the application of quarry dust (QD), crushed waste ceramics (CWC), palm bunch ash (PBA), crushed waste ceramics base geopolymer cement (CWCbGPC) and palm bunch ash base geopolymer cement (PBAbGPC) in the treatment of soil has been studied. The need to encourage the use of supplementary cementing materials in construction works is of great necessity. This is because of the further damage the emission of CO_2 is causing and its contribution to global warming. Laboratory experiments have been adopted to investigate the behaviour of test soil on the addition of admixtures. After the preliminary study, it was shown that the test soil was an A-7 soil according to AASHTO classification system and poorly graded soil of high clay content (GP/CH) according to the USCS. The treatment protocol was used to study the consolidation settlement (CS) of the treated test soil and results showed that the CS reduced steadily at the varied addition of the cementing additives. A more remarkable improvement was recorded with the geopolymer cements (GPC). The results equally showed that the PBAbGPC was observed to be better than the CWCbGPC in the treatment protocol. The exercise not only achieved the ridding the environment of solid wastes but showed that these waste materials could be reclaimed and synthesized into alternative cementing materials to replace ordinary Portland cement and remove its attendant CO_2 emission and the global warming effects from the atmosphere.