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GEOTECHNICAL PROPERTIES OF MINING WASTE STABILISED WITH LIME – GYPSUM

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ABSTRACT

This paper presents a study on the stabilisation of mining waste from Sabah, Malaysia using admixture of lime gypsum and soil. The physico-chemical properties studied consists of pH, particle size distribution, compaction, unconfined compressive strength and permeability. The mineral identification were examined using X-ray diffraction (XRD) and Scanning electron microscopic (SEM). In this study, different percentages of lime, gypsum and fine material were added into the mining waste. For the stabilisation purposes, 20% of clayey materials from weathered shale were added into mining waste to act as a pozzolana before adding stabilising agent i.e lime and gypsum. The samples were cured for 1 day, 14 days, 28 days, 45 days and 100 days at room temperature before unconfined compressive test were performed. The surface micromorphology of samples was analysed using SEM. The results of unconfined compression test for the unstabilised samples show the strength is between 11 kPa to 15 kPa. The absence or very low chemical cementation between minerals particles in mining waste resulted in the low strength. In contrast, stabilised samples shows immediate increased of strength with the increase percentages of lime and gypsum added into mining waste. This is due to the formation of cement minerals as detected from the SEM. Mining waste stabilised with 6% lime show the maximum strength after curing for 7 days, 14 days, 28 days, 45 days and 100 days. Whereas, mining waste stabilised with 8% gypsum has the maximum strength. The results of compressive strength also show the maximum strength is achieved with a mixture of 3% lime and 3% gypsum. From this study, it is concluded that the intensive pozzolanic reactions with the addition of lime, gypsum, and lime-gypsum mixture into mining waste produce cement minerals, creating bridge-like structures, cementing the original minerals and creating high inter-particle contact orientations; hence the increase in strength.