Geotechnical properties of unprocessed soil from abandoned Mamut mine in Sabah, Borneo

ABSTRACT

The issue related to the geotechnical stability of land mining area in Malaysia had become more critical after a strong earthquake struck Sabah, Borneo in 2015 centred in Ranau District where Mamut copper mine is located. As part of safety assessment and future planning, knowledge of soil characteristics in this risky area is necessary. This paper presents some findings on geotechnical properties of unprocessed soil obtained from the abandoned mine. Results found that Mamut soil can be classified as SW and has higher coarse-grained percentage (97.4%) compared to other copper mines elsewhere. The soil also has higher permeability (3.61 x 10-3 m/s), lower organic content (0.15%), lower pH (4.53), higher specific gravity (2.75) and higher maximum dry density (1780 kg/m3). Mamut soil is found to be cohesionless, while the angle of friction shows a variation with the relative compaction. Chemical analysis shows that SiO2 and C12H10MgO6S2 are the two predominant compounds of the soil. Morphologically, Mamut soil appears to be composed of powdered and hardened particles with dark brown colour. They contain higher amount of irregular-shaped particles but well-rounded and spherical shapes are also observed. Smooth surfaces with no agglomeration between particles indicates that the strength value of the soil is low due to the weak bonding between the loose grain structure. These findings suggest that Mamut soil is suitable for chemical stabilisation or remediation method such as microbiologically induced calcite precipitation (MICP).