Paper A15

Physico-chemical behavior of carbonaceous shale at Batu Gajah, Perak: Their problems and mitigation

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The Paleozoic carbonaceous shale exposed around Batu Gajah is interbedded with sandstone and siltstone, which is sandwiched in between Kinta Limestone over a total thickness estimated to be about 3,000 m. It deposited within deep marine environment indicated by the dissemination of reduction pyrite. The exposures along Seputeh-Batu Gajah (new road) were studied whenever numbers of slope failure occurred along the stretch, as well as stained road surfaces and drains, which is believed trigger by the material properties of black shale. Chemical weathering is the only factor that contributes to the change of chemical and physical properties of the carbonaceous shale. Acid rock drainage (ARD) is one of the environmental problem occurred and it produced by the oxidation of sulphides minerals, such as pyrite and marcasite (FeS_2). Both of these phenomena can affect the physical and chemical properties of the carbonaceous shale. Acid Rock Drainage is found around the world both as a result of naturally occurring processes and activities associated with land disturbance such as highway construction and mining where acid-forming minerals exposed to the air and water. These acidic can cause metal in geologic material to dissolve, which can cause a very serious contamination and damage the environment for the flor and fauna around the area. Acidic soil contributed by pyrite oxidation in carbonaceous shale has a very low pH near 3. An appropriate method need to be implemented in order to treat the acidic soil problem. Due to the high acidity, plants or vegetation are unable to grow. The growth of plants or vegetation is important because the roots of the plant can serve as natural fibe reinforcement and will increase the resistance to slope failures. Pyrite oxidation, also referred to as pyrite disease or pyrite decay, is identifie by a sulphuric acid odor, white crystalline powder, yellow sulphide powder, and/or gray to yellowish microcrystalline mass in and out of specimens. One of the important approaches to prevent pyrite

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oxidation is to create a surface coating on pyrite. In the study conducted, a coating of iron 8–hydroxyquinoline was formed by leaching pyrite with a 0.10M H_2O_2/0.0034 M 8-hydroxyquinoline solution; stability of the coated pyrite was tested under various pH and temperature conditions. It shown the iron 8-hydroxyquinoline coating could significantl suppress further pyrite oxidation by both chemical (H_2O_2) and biological (*Thiobacillus ferrooxidans*). Ammonium gas and ethanolamine thioglycollate treatments neutralize sulphuric acid and remove ferros-sulphate, and are reportedly effective in partly or completely removing oxidation reaction products. Calcium carbonate or limestone powder can also be utilized to treat the ARD, where the exposed black shale covers by calcium carbonate, and then cover back by layer of softwood and hardwood. These mitigation methods suggested can be implemented to enhance the growth of grass and stabilize slopes.