Geophysical Research Abstracts
Vol. 17, EGU2015-3175, 2015
EGU General Assembly 2015

Rheological characteristics of waste rock materials in abandoned mine deposit and debris flow hazards

Sueng-Won Jeong (1), Choonoh Lee (2), Yong-Chan Cho (3), and Ying-Hsin Wu (4)

(1) Korea Institute of Geoscience and Mineral Resources, Daejeon, Republic of Korea (suengwon@hotmail.com), (2) Korea Institute of Geoscience and Mineral Resources, Daejeon, Republic of Korea (colee@kigam.re.kr), (3) Korea Institute of Geoscience and Mineral Resources, Daejeon, Republic of Korea (chojch@kigam.re.kr), (4) Project center on natural disaster reduction, Shimane University, Japan (wu.ahsin@gmail.com)

In Korea, approximately 5,000 metal mines are spread, but 50% of them are still abandoned without any proper remediation and cleanup. Summer heavy rainfall can result in the physicochemical modification of waste rock materials in the mountainous. From the geotechnical monitoring and field investigation, there are visible traces of mass movements every year. Soil erosion is one of severe phenomena in the study area. In particular, study area is located in the upper part of the Busan Metropolitan City and near the city's water supply. With respect to the supply of drinking water and maintenance of ecological balance, proper disposal of waste rock materials is required. For this reason, we examine the rheological properties of waste rock materials as a function of solid content using a ball- and vane-penetrated rheometer. In the flow curves, which are the relationship between the shear stress and shear rate of waste rock materials, we found that the soil samples exhibited a shear thinning beahivor regardless of solid content. The Bingham, Herschel-Bulkley, Power-law, and Papanastasiou models are used to determine the rheological properties. Assuming that the soil samples behaved as the viscoplastic behavior, the yield stress and viscosity are determined for different water contents. As a result, there are clear relationships between the solid content and rheological values (i.e. Bingham yield stress and plastic viscosity). From these relationships, the maximum and minimum of Bingham yield stresses are ranged from 100 to 2000 Pa. The debris flow mobilization is analysed using a 1D BING and 2D Debris flow models. In addition, the effect of wall slip and test apparatus are discussed.