Alkali Phosphate Treatment For The Reduction of Acid Rock Drainage

JUNG HWA LEE, MI REE KANG, CHUL-MIN CHON, IN HYUN NAM, YONG CHAN CHO, JUNG HO RYU, YOUNG SUK SONG AND JAE GON KIM*

KIGAM (Korea Institute of Geoscience and Mineral Resources), 124, Gwahak-ro, Yuseong-gu, Daejeon 34132, Korea (ljh@kigam.re.kr)
(*correspondence : jgkim@kigam.re.kr)

Acid rock drainage(ARD) at construction sites in Korea has been an environmental concern due to its high acidity and high concentration of toxic element. In this study, the column test was conducted to find out about the inhibitory effect of alkali phosphate treatement on ARD production. Mesozoic andesite with a high ARD generation potential indicated by 6.9% of S and NAG pH 2.32 was collected from the railway embankment site, where the contamination of surface water and soil by ARD occurred in two years after the completion of construction work. The collected rock sample was crushed to be less than 3/8 inches in diameter and filled acrylic tubes with a diameter of 20 cm and a height of 80 cm. The columns were incubated with wet and dry rotational repeat by 2 weeks periodic addition of distilled water. After the incubation, two treatments for the ARD reduction were conducted with duplicate columns : 1) the addition of 10 mM KH_2PO_4 & 3 % $NaHCO_3$ and 2) the addition of 10 mM KH_2PO_4 & 3 % $NaHCO_3$ and ordinary portland cement(OPC) on the top of the column. After the treatments, 500 ml of distilled water added to each column for every one week for 3 weeks and then the columns were flushed with 1,500 ml of distilled water in the 4^{th} week. The incubation and flushing were lasted for 53 week. The pH, electrical conductivity(EC), concentrations of anions and cations of the leachates were determined. The effect of the alkali phosphate treatement decreased after 41 weeks of the experiment. The concentration of heavy metals of the leachates sharply increased with decreasing the pH below 4.5. It was estimated that the ARD reducing effect of the alkali phosphate treatment can last for 2 to 7 years considering the infiltration rate and annual mean precipitation of the railroad site.