

Treatment of arsenate in acid mine drainage by a permeable reactive barrier bearing granulated blast furnace slag: Column study

K. SASAKI*, S. NUKINA, W. WILOPO AND T. HIRAJIMA

Department of Earth Resources Engineering, Kyushu University, Fukuoka 819-0395, Japan

(*correspondence: keikos@mine.kyushu-u.ac.jp)

Immobilization of arsenate in groundwater impacted by acid mine drainage was investigated using a permeable reactive barrier (PRB) column bearing granulated blast furnace slag (GBFS) to compare with iron granules which are commonly used. Sorption capacity of arsenate onto the GBFS was quite lower than iron granules in the amount of sorbed arsenate per unit surface area of sorbents (mmol/m^2) at the equilibrium, Q' , in two orders of magnitude in batch tests, however, the amount of sorbed arsenate per unit amount of sorbents (mmol/kg) at the equilibrium, Q , were comparative to each other, because of much higher porosity in the GBFS. Results of column performance showed that 15 mg/L of As was decreased to be less than 0.4 mg/L for more than 18 pore volumes (pv) in the GBFS-PRB by sorption, co-precipitation and presumably formation of hydrated calcium arsenate, and less than 0.04 mg/L for more than 17 pv in the iron bearing PRB probably by co-precipitation with iron (oxyhydro)oxides. Additionally 15 mg/L of Mn^{2+} ions was also decreased to less than 0.3 mg/L and 0.03 mg/L, respectively, in iron bearing and the GBFS bearing PRB columns, probably caused by sorption and precipitation of oxides and carbonates. When 10(v/v)% of the GBFS was used in PRB with 1 m of thickness, it was estimated that 1 mg/L of arsenate would be treated for 30 years. The life span is comparative with that of iron granules-PRB in the long term scale. The GBFS has advantages to compensate its low reactivity with high porosity, to facilitate the industrial handling with low density, and to utilize industrial wastes for more valuable applications, emphasizing a potential of alternative reactive materials instead of iron granules in PRB for immobilization of arsenic and manganese in acid mine drainage.

Wakurayama dacite as a possible adakites from the Matsue city, inner zone of Southwest Japan Arc

D. SATO AND I. MATSUMOTO*

Faculty of Education, Shimane University, Matsue, 690- 8504, Japan

(*correspondence:chromim@edu.shimane-u.ac.jp)

Introduction

The petrological and geochemical characteristics of the Wakurayama dacite, Matsue city, Southwest Japan have been examined. The activity of the Wakurayama Dacite is about 5 Ma ago [1, 2]. In this study, petrological details of Wakurayama dacite became clear. We classified this dacite by the color of the surface of the rock and texture under the microscope. And bulk chemical compositions of rocks were determined by using of XRF method.

Results and Discussion

Wakurayama dacite is basically divided into three groups which are Red, Olive and Gray groups by their color. Those groups can be also distinguished compared with the amount of the minerals and with bulk rock chemical compositions. These groups having flowed in order of Gray group, Olive group and Red group became clear by their stratigraphy. In addition, the important geochemical feature is that tholeiitic rock series and calc-alkaline rock series are coexistent in one volcano. That is Gray group (FeO^*/MgO ratio: 2.55 in average), Olive group (FeO^*/MgO ratio: 6.42 in average) and Red group (FeO^*/MgO ratio: 2.51 in average) are tholeiite, calc-alkaline and tholeiitic rock series respectively. And almost all rocks of Wakurayama dacite show high in Al (18.96 wt% in average), low in Mg (1.36 wt% in average), high in Sr (636 ppm in average) and low in Y (10 ppm in average). Above chemical features of wakurayama dacite is very similar with adakites [3]. That is Wakurayama dacite magma may derived from the subducted materials like oceanic sediment.

[1] Miyajima *et al.* (1972) *Mem. Fac. Lit. & Sci., Shimane Univ., Nat. Sci.*, **5**, 131-140. [2] Kano *et al.* (1993) *Geology of Matsue district. Geol. Soc. Jpn.*, p126. [3] Defant & Drummond (1990) *Nature*, 662-665.