Arsenic contamination in crop plants from Vietnam and Cambodia

Nguyen Thi Ha[1], Myoung-Soo Ko[1], Kongkea Phan[2] and Kyoung-Woong Kim[1, 3*]

[1] School of Earth Sciences and Environmental Engineering, Gwangju Institute of Science and Technology (GIST), Gwangju 61005, Korea
[2] Faculty of Science and Technology, International University, Phnom Penh, Cambodia
[3] Faculty of Environmental Studies, Universiti Putra Malaysia (UPM), 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia

Abstract

Arsenic released from the mining, smelting and industrial sectors is common contaminant of arable soil. It can be accumulated by crop plants from soil and eventually entered into the human body through food consumption. Arsenic is one of the most hazardous elements in this soil-plant system and its uptake by rice became the potential threat to human health especially in Southeast Asia. In this scenario, we initiated the geochemical survey to investigate the distribution of As concentration in soil, water, crop plant including rice in the vicinity of Nui Phao mine in Vietnam which is the second largest production of W after China.

In order to examine the geochemical dispersions of As in Nui Phao mine area, 4 batches of sampling were conducted. The preliminary geochemical survey was carried out in summer 2016 to collect the soil, water and sediment samples. The second batch of sampling was carried out in November 2016, and the third batch of sampling was carried out in June 2017 in targeting the pair of paddy soil and rice samples. The fourth batch of sampling was finished in June 2018. Analytical results revealed that As concentrations in paddy soil and rice samples are significantly higher than Vietnamese and Codex standard. The residents in Thai Nguyen province are potentially exposed to the risk of As intake from their daily rice consumption. Therefore, average daily dose should be estimated and the chemical speciation of As in soils will also be determined to evaluate the portions of mobile and/or bioavailable fractions in soil. For comparison, crop plant samples were collected and comprehensive risk assessment result is being compared with those in Cambodia.

Keywords: Arsenic, Nui Phao mine, Vietnam, Cambodia, Rice