[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-GE Geological & Soil Environment

[A-GE30]Energy-Environment-Water Nexus and Sustainable Development

convener:Ming Zhang(Institute for Geo-Resources and Environment, Geological Survey of Japan, AIST), Ken Kawamoto(Graduate School of Science and Engineering, Saitama University), Xue Qiang(中国科学院武漢岩土力学研究所, 共同), Jet-Chau Wen(National Yunlin University)
Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
This session provides a broad platform for discussion and presentation of fundamental and up-to-date scientific results related to clean energy production, environmental remediation and restoration, waste management, water cycle, monitoring of water quality, management of water resources and interconnections among them for sustainable development. Presentations on the topics associated with social science that enhance public awareness, stakeholder empowerment and involvement, and policy decisions regarding the management of water, energy and the environment are also encouraged.

[AGE30-P07]Geochemical Characteristics and Toxic Elements in Red Mud and Leachate from Red Mud Management Facilities

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Keywords:red mud, leachate, geochemical properties, elements

Red Mud (RM, AKA “bauxite residual”) is the insoluble residue from bauxite refining for aluminum oxide (Al_2O_3), and has very fine particle size (dust) and strong alkalinity (pH>12). Each year, about 60 million tons of RM are produced worldwide. China is the largest producer both of alumina and RM in the world, and about 6 million tons of RM are generated in China. Currently, the most common ways of red mud disposal of is storing the RM in management facilities, such as stockpiles or reservoirs. Based on the regulation for RM management in China, 1.5-m compacted soil liner with hydraulic conductivity of 1×10^{-7} m/s (or design with equivalent hydraulic performance) is required to line the reservoir to avoid secondary contamination by the leachate (or porewater) from the RM. However, leakage of leachate is likely to occur when liner is improperly built. Moreover, several accidents have been reported, where the failure of reservoir dam induced severe leakage of leachate to the surrounding soil and groundwater.

This study aims to understand the potential environmental impact by the leachate of RM from management facilities. A nationwide investigation was carried out to evaluate the geochemical characteristics and toxic elements of RM and its leachate in China. The result shows the geochemical characteristics of RM depend greatly on the bauxite sources and refining processes. The main mineral phases found in the RM are quartz, calcite, dolomite, hematite, hibschite, sodalite, anhydrite, cancrinite, and gibbsite. The bulk chemical compositions of RM are mainly Al, Fe, Si, Ca and Ti, and hydroxides. Metal and metalloid elements, such as Cr and Mn, were observed with trace concentration levels. The RM leachate is hyperalkaline (pH>12), which is likely to induce severe dissolution of minerals, and destroy the soil texture. Elements, including, major elements (Al, Na), minor elements (As, Cr, Cu, Fe, Ni, Mn, Mo, Zn), and trace elements (Ag, Be, Cd, Hg, Pb, Sb, Se, Tl) in the leachates were found to exceed the required water quality (USEPA and China MEP) of groundwater (or drinking water) by up to 1359 times, which is like to contaminate groundwater or drinking water sources. Additionally, the results suggest that the concentration of As, Cr, Ni, Zn, Be, Cd, Hg, Pb and Se in the leachate also exceeded the integrated wastewater discharge standard (GB8978-1996), and the leachate need proper treatment before

discharge into surface water.