



*Proceedings of Iran International Aluminium Conference (IIAC2018)  
April 24-25, 2018, Tehran, I.R. Iran*

## **Recovery of Metals from Red Mud Using Mineral Acids**

Zahra Karimi, Ali Allahverdi\*, Mostafa Mahinroosta

Research laboratory of Inorganic Chemical Process Technologies, School of Chemical Engineering, Iran University of Science and Technology, Narmak 1684613114, Tehran, Iran

**Abstract:** Red mud is a hazardous waste generated at the end of the Bayer process for alumina production from bauxite. If not managed properly, red mud imposes serious threats to the environment and public health. In most cases, it contains high amounts of iron as well as some amounts of aluminium, titanium, sodium and other valuable metals. Retrieving these valuable elements has attracted the growing interest of the researchers. In this study, the dissolution efficiency and recovery of various metals are investigated using various single and mixed mineral acids. The conditions for dissolution experiments were: temperature of 85 °C, reaction time of 120 minutes, liquid-to-solid ratio of 20 ml/g, and a constant acid concentration of 3 N. The results showed that among different acids and acid mixtures used, 3 N HCl, 3 N HNO<sub>3</sub>, and 3 N acid mixture of HCl:HNO<sub>3</sub> (1:1) containing 3 wt.% of HF exhibit the highest dissolution efficiency of 79.35%, 79.70% and 80.37%, respectively. Finally, the concentration of various metal elements in the leachates obtained from these acids was determined by inductively coupled plasma atomic emission spectroscopy (ICP- AES) analysis. The ICP- AES analyses revealed that the acidic mixture of HCl:HNO<sub>3</sub> (1:1) containing 3 wt.% of HF can recover Al, Ca, Ce, Fe, Mg, Na, Sc, Si, Ti, and Zr better than both 3 N HCl and 3 N HNO<sub>3</sub>.

**Keywords:** Red mud, Recovery, Metal, Dissolution, Rare earth element