

Influence of Thermal Treatment on Copper Extraction from Electronic Wastes(Article)

Akhmetvaliyeva, Z.M.(a)Email Author, Kulenova, N.A.(a)Email Author, Mamyachenkov, S.V.(b)Email Author, Anisimova, O.S.(b)Email Author, Fokina, E.L.(c)Email Author [View Correspondence \(jump link\)](#)

a)D. Serikbayev East Kazakhstan State Technical University, Ust-Kamenogorsk, 070010, Kazakhstan

b)Ural Federal University, Yekaterinburg, 620002, Russian Federation

c)Saint Petersburg University, St. Petersburg, 199034, Russian Federation

Краткое описание

The results of studying the influence of the preliminary thermal treatment of crushed electronic waste (EW) at a temperature of 450°C on the copper extraction degree during the subsequent leaching of materials by solutions of nitric acid are presented. The waste of the electronic industry, in particular, automobile microcircuits and computer printed circuit boards, is chosen as a research object. It is experimentally determined that the percentage of the organic phase in the composition of the research object varies within the range of 20–25% of the mass of the crushed raw material. The results of thermogravimetric analysis (TGA) and X-ray fluorescence analysis (XRF) show that the maximum degree of organic removal and formation of oxide forms of metals are observed in the temperature range 400–450°C. A mathematical model of the copper leaching process from EW with nitric acid solutions is obtained. The optimum parameters for the process are found: the temperature in the system is 75°C, the duration of leaching is 150 min, and the concentration of acid is 4 M with the maximum copper extraction to the solution being 98%. A comparative analysis of leaching processes of two types of materials (after thermal treatment and without thermal treatment) was carried out. It is experimentally confirmed that, for materials after preliminary thermal treatment, more completed copper leaching from EW with nitric acid solutions of lower concentration is provided when compared to the leaching of raw materials without thermal treatment. It is proved that, due to the preliminary thermal treatment of the materials, phase changes occur in the composition of the research object, namely, the transition of metals to their oxide forms, which positively affects the degree of copper extraction from EW at the subsequent nitric acid leaching. © 2018, Allerton Press, Inc.