World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:11, No:11, 2017

Effect of Flux Salts on the Recovery Extent and Quality of Metal Values from Spent Rechargeable Lead Batteries

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Abstract : Lead-calcium alloy containing up to 0.10% calcium was recovered from spent rechargeable sealed acid lead batteries. Two techniques were investigated to explore the effect of flux salts on the extent and quality of the recovered alloy, pyro-metallurgical and electrochemical methods. About 10 kg of the spent batteries were collected for testing. The sample was washed with hot water and dried. The plastic cases of the batteries were mechanically cut, and the contents were dismantled manually, the plastic containers were shredded for recycling. The electrode plates were freed from the loose powder and placed in SiC crucible and covered with alkali chloride salts. The loaded crucible was heated in an electronically controlled chamber furnace type Nabertherm C3 at temperatures up to 800 °C. The obtained metals were analyzed. The effect of temperature, rate of heating, atmospheric conditions, composition of the flux salts on the extent and quality of the recovered products were studied. Results revealed that the spent rechargeable batteries contain 6 blocks of 6 plates of Pb-Ca alloy each. Direct heating of these plates in a silicon carbide crucible under ambient conditions produces lead metal poor in calcium content (< 0.07%) due to partial oxidation of the alloying calcium element. Rate of temperature increase has a considerable effect on the yield of the lead alloy extraction. Flux salts composition benefits the recovery process. Sodium salts are more powerful as compared to potassium salts. Lead calcium alloy meeting the standard specification was successfully recovered from the spent rechargeable acid lead batteries with a very competitive cost to the same alloy prepared from primary resources.

Keywords : rechargeable lead batteries, lead-calcium alloy, waste recovery, flux salts, thermal recovery
Conference Title : ICMMPME 2017 : International Conference on Mining, Mineral Processing and Metallurgical Engineering
Conference Location : Venice, Italy
Conference Dates : November 13-14, 2017