

Feasibility of Recovery Alumina from Coal Fly Ash

H.M. Zhou , Y. Luo, J.G.Yu, X.C. Qiao

School of Resource and Environmental Engineering, East China University of Science and Technology, Meilong Road 130, Shanghai, China, 200237

KEYWORDS: fly ash, extraction, alumina, sintering

ABSTRACT

Coal fly ash (CFA) is a by-product generated from coal burning power station. More than 2,700 million tons of CFA has been dumped in ash-bin and remained unused in China. It is hence necessary to investigate further application of CFA except for building materials. The statistical average Al_2O_3 content of CFA in China is around 30 wt.% and the CFA thus has potential to be used as an alumina resource. A class C (high calcium) and a class F (low calcium) CFA were used in this research to investigate the feasibility of alumina recovery from CFA. The two CFA were, respectively, blended with required amount of calcium hydroxide and a chemical additive and sintered from 800 to 1100°C for one hour. The microstructure and aluminum extraction of each sintered sample have been characterized using XRD, SEM and hydrochloric acid extraction methods. The results showed that 54.63wt.% of aluminum can be directly extracted from class C CFA (CCFA), however, only 8.75wt.% of aluminum was extracted from class F CFA (FCFA). The aluminum extraction from both CCFA and FCFA increased largely with the sintering temperature up to 900°C. 95wt.% of aluminum from CCFA and 85wt.% from FCFA were extracted from 900°C treated samples. Anorthite ($\text{Ca}(\text{Al}_2\text{Si}_2\text{O}_8)$) is the main product in the sintered samples and increased with sintering temperature. The optimum addition of calcium hydroxide depended on the requirement for the formation of Anorthite in the CFA sample.