

Determining the Suitability of a Fly Ash for Silica Extraction and Zeolitisation

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ABSTRACT

Zeolitic material may be obtained from fly ash both by direct conversion of the ash or from SiO₂ extracts obtained from fly ash. This study focuses on determining the suitability of a fly ash for SiO₂ extraction and for direct zeolitisation. The SiO₂ extraction experiments from different fly ashes show that the main parameters governing the SiO₂ extraction are: a) a high bulk SiO₂ content in the starting fly ash, b) a high proportion of the bulk SiO₂ present in the degradable glass matrix and the highly soluble opaline fraction, and c) a high bulk SiO₂/Al₂O₃ ratio of the fly ash. The results from experiments of fly ash zeolitisation by direct conversion demonstrate that the most important criteria for the selection of a fly ash for this process are: a) a high content of Al₂O₃ and SiO₂, b) a high glass content and c) relatively low SiO₂/Al₂O₃ ratio. Multivariate analysis confirms the importance of the above-mentioned variables and shows some additional variables that have influence on ash behaviour under alkaline conditions. It quantifies the use of those variables for determining the suitability of ashes for SiO₂ extraction and zeolitisation and is able to distinguish between the two.