

## **THE EFFECT CALCINATION METHOD AND CLAY PURITY ON THE PERFORMANCE OF METAKAOLIN-BASED GEOPOLYMERS**

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The calcination of kaolinite clay to produce metakaolin can be achieved using a range of processes, including rotary, fluidised bed and flash calcination. Rotary calcination was the most popular of these processes for many years as it takes place in a rotary kiln, which is readily available, at easily attainable temperatures of 650 – 800 °C. However, in recent years' flash calcination processes have become more widely used, and the technology has advanced to a point where commercial flash metakaolin-based geopolymers are now available. Flash calcination involves the rapid heating of clay at temperatures of around 1000 °C for less than a few seconds. The differences in these calcination methods can have a notable effect on the structural ordering of the metakaolin itself, as well as playing an important role in defining the chemical and physical properties of metakaolin-based geopolymers. The purity of the clay also plays a key role in the chemistry of the geopolymers produced.

Calcined clay-based geopolymers can be used as construction materials or for the immobilisation of problematic wastes, among other applications, as they can offer desirable performance characteristics. The chemical and physical properties of these geopolymers, and thus the influence of the clay source on key performance parameters, will need to be fully understood when deciding how they can be used for many different applications.

This study demonstrates the effect of the calcination method on the properties of calcined metakaolin geopolymer systems for waste immobilisation applications. A main focus of this study is the rheological properties, as the flow properties of these systems are one of the most important parameters for many geopolymer applications. The porosity, heat evolution and mineralogical development of these systems is also presented, with a view towards assessing performance in targeted applications for the immobilisation of nuclear waste.