

The Measurement of Binary Cement Blends with AC Impedance and UPV (Ultra Pulse Velocity) Techniques

S.S. Potgieter-Vermaak¹, B. Popoola², J.H. Potgieter³

¹*School of Chemistry, University of the Witwatersrand, Wits, South Africa*

²*Tshwane University of Technology, Pretoria, South Africa*

³*School of Chemical and Metallurgical Engineering, University of the Witwatersrand, Wits, South Africa*

The manufacture of cements according to the EN 196 norm allows for the addition of secondary cementitious materials such as fly ash, slag and limestone, to be added to OPC (ordinary Portland cement) to produce various blends with selected final strengths. Although intermediate and final strength requirements are the criteria to be met, it is often necessary and useful to have a way of estimating or determining the amounts of secondary cementitious materials added to the OPC. Various laborious wet chemical techniques and methods are available to do such measurements, and almost all of them are destructive in nature.

This work will describe two techniques to estimate the contents of binary cement fly ash blends. AC Impedance spectroscopy is often used in studies of cement hydration, but the work performed and described in this contribution will illustrate how it can simultaneously be utilised on calibrated samples to estimate composition.

A particularly popular non-destructive tool for measurements of cement and concrete quality, is UPV or ultrasonic pulse velocity measurements with ultrasound. This technique has been employed to investigate the composition of various binary OPC fly ash blends, and it was found that there is a direct relationship between the UPV value measured for a particular blend and its composition.

Both the proposed techniques are non-destructive in nature and offer a fast and convenient way to estimate the composition of binary OPC blends.