

# UNDERSTANDING THE RELATIONSHIP BETWEEN MICRO AND MACRO-SCALE PROPERTIES IN SODIUM SILICATE ACTIVATED SLAG-FLY-ASH BINDERS

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Sodium silicate activated slag-fly-ash binders (SFBs) are room temperature hardening binders that have excellent mechanical properties and significantly lower carbon footprint than OPC. The aim of this study is two-fold. One is to understand setting in slag fly ash binders as a function of slag/fly ash ratio by using two complementary methods namely, Ultrasonic Wave Reflectometry (UWR), and modified Procter penetration test (ASTM C403). The other aim is to develop a method to differentiate and quantify all poorly-ordered phases (unreacted slag, unreacted fly ash, C(A)SH and geopolymer) present in slag fly ash binders as a function of curing time, curing temperature and slag/fly ash ratio. This was achieved by using selective chemical extractions and nuclear magnetic resonance (MAS-NMR) spectroscopy of binders and extraction residues. The results from MAS-NMR were used to explain the observed trend in compressive strength, as a function of the same variables listed above.

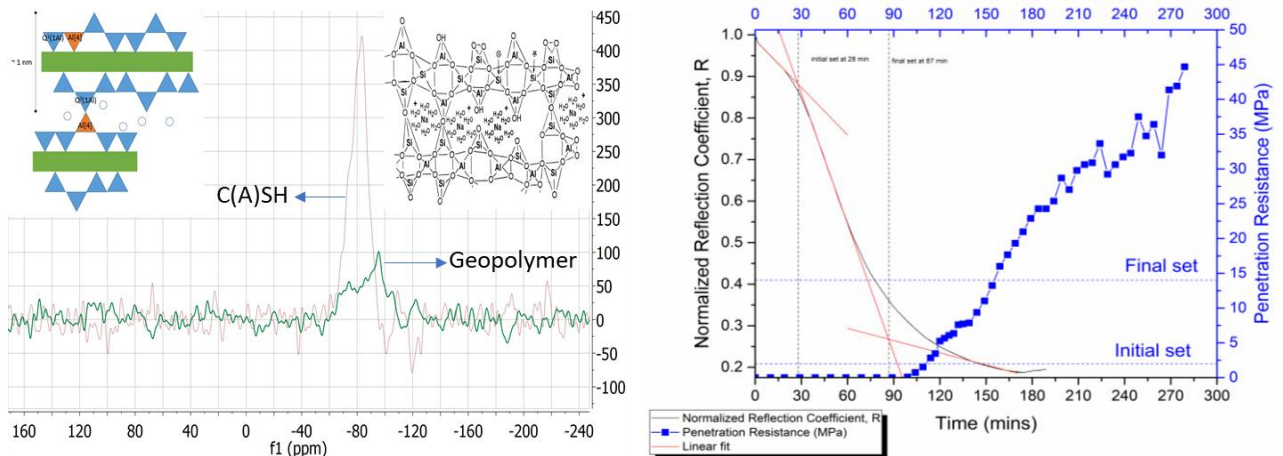


Figure 1 – (left)  $^{29}\text{Si}$  MAS-NMR of poorly-ordered phases in SFB (right) UWR and penetration test for monitoring setting in SFB