

Transformation of Bauxite Residue into a Reactive Supplementary Cementitious Material

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ABSTRACT

In recent years, a new supplementary cementitious material (SCM) has been developed as a solution for the disposal of bauxite residue (BR), the alkaline residue generated by the alumina industry. This material is known as vitrified bauxite residue (VBR) and involves melting a mix of BR, and some minor fluxes at a temperature of 1200 °C followed by quenching. The purpose of this study was to investigate the reactivity and hydration of ground VBR in binary blends (with Portland cement (PC)) and ternary blends (with PC and limestone) for the production of pastes and mortars. Results indicate that VBR is actually a highly reactive SCM in the range of class C fly ash and ground granulated blast furnace slag, and its reactivity is significantly enhanced by the use of the grinding aid Triisopropanolamine (TIPA). An important synergy between limestone and VBR was identified, due to a difference in hydration products, allowing a strength activity index >80 % at 7 and 28 days, respectively, with only 53 wt% of PC.