The use of industrial by-products to partly or totally substitute ordinary Portland cement (OPC) becomes major research interest. Not only for economic purposes but also for environmental aspects, as the production of OPC has greatly contributed to the production of CO₂ to the atmosphere.

Ground granulated blast furnace slag (GGBS) and pulverised fly ash (PFA) are two common industrial by-products to be used as partial replacement material for ordinary Portland cement (OPC). The materials have been shown to provide enhanced durability properties and to have a beneficial environmental impact. However there is a limit of level of replacement in blended cements to maintain strength and durability.

Recent research has shown that it is possible to use 100% PFA or GGBS as a binder in mortar and concrete by activating them with an alkali component. Two different products of the activation are fly ash based geopolymer and alkali activated slag (AAS). The development of these materials is still at the early stages, with little knowledge about the durability of the materials. This research studies the early age strength and durability characteristics of a range of geopolymer and AAS mortars and concrete. The characteristics investigated included strength development, chloride diffusion, resistivity, ultrasonic pulse velocity, sorptivity and carbonation.