Development Of Sustainable Unfired Green Bricks Using Construction Demolition Wastes

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Over 20 million tonnes of Construction Demolition Waste (CDW) are generated annually in Australia's building and construction industry. More than 35% of CDW is disposed of in landfills. The annual growth rate of CDW generation is 2%, and it is having an ever-increasing effect on environmental and waste management policies on a national scale. The building and construction industry has the capacity to utilise a substantial amount of CDW by developing cutting-edge recycling and manufacturing procedures that incorporate CDW into high-value sustainable brick products. Substituting alkali-activated binders with ordinary Portland cement in unfired bricks is another promising solution to enhance sustainability while not sacrificing the physio-mechanical performance of the bricks. This research presents the results of an experimental investigation on the development of unfired, green brick (UGB) with alkali-activated binder and CDW to boost the recycling capacity of CDW, thereby reducing landfilled waste and enhancing sustainability and resource efficiency. The effect of mixture-design parameters, including binder types, alkaline modulus, activator-to-binder ratio, and CDW pre-treatment methods, were investigated on the micro-structural, physical, and mechanical properties of Fly ash/Slag-based UGB produced by the pressure forming process. The results revealed that the developed UGB could pass the Australian standards requirement for water absorption, dimensional stability and compressive strength for non-structural purposes. The results demonstrated that mixture-design parameters significantly influence the physio-mechanical and chemical properties of UGB, and chemical surface modification of CDW improved the surface quality of the recycled aggregate, resulting in the production of UGB with improved physical and mechanical properties.