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Green geopolymetric concrete using grits for applications in construction

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Abstract

This work investigates the production a green geopolymer-based concrete for a sustainable construction material using biomass wastes from a kraft pulp industry: fly ash (as main alumina-silicate source) and grits (as aggregate). Moreover, a simple, reproducible, ambient temperature, and low-cost manufacture is followed. Mix design aims to maximize wastes incorporation and optimize the mechanical performance. Preliminary tests indicate that the used wastes may be successfully employed to produce green geopolymetric concretes with satisfying mechanical performance (up to 18 MPa), according to the European standards. Furthermore, they represent a viable solution to reduce the environmental footprint associated with waste disposal.

Keywords: geopolymetric concrete, biomass fly-ash, grits, mechanics, construction

1. Introduction

Construction is one of the worldwide most active and growing industry. Nevertheless, its development is highly unsustainable since consumes relevant non-renewable raw materials and energy, while generates greenhouse gases/wastes' enormous volumes [1]. Therefore, development of cost-effective manufacture processes and novel sustainable construction materials is a major concern [2-4]. Nowadays, geopolymers (GP) are considered a viable alternative to OPC [5-6]. They are inorganic alkali-activated binders made of a reactive solid alumina-silicate source interacting with an alkaline solution [6-7]. Moreover, the use of alumina-silicate-based wastes further reduces GP greenhouse footprint. An accurate mix design allows to engineer novel GP-materials with comparable physico-mechanical properties than traditional mortars/concretes [8-12].

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