Effectiveness of Low-Concentration Acid and Solar Drying as Pre-Treatment Features for Producing Pozzolanic Sugarcane Bagasse Ash

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ABSTRACT
In the production of sustainable concrete, it is quite essential to develop highly reactive silica rich materials to substitute cement. Sugarcane bagasse ash as one of the agricultural based pozzolan gained less popularity due to its relatively low amorphous silica content after incineration process (<50% silica). Therefore, an alternative approach was studied in this research to extract high proportion of amorphous silica from sugarcane bagasse that fulfils the minimum requirement of pozzolanic standard. The process was divided into three stages, which were obtaining optimum pre-treatment variables, obtaining optimum burning variables, and substantiation of pozzolanic feature. Pre-treatment were done to remove all impurities and deleterious material from the ash. It involved soaking of bagasse in different concentrations of hydrochloric acid solution for different interval of time after which it was dried in a dedicated solar drying chamber. Bagasse treated with optimum parameter would then undergo burning process with various temperatures and durations. The produced ash was characterized by determining different oxides composition, particle size analysis, mineralogical characteristics and micro-structure using X-ray fluorescence, nitrogen adsorption, X-ray diffraction, and field emission scanning electron microscope, respectively. The production process was considered environmentally friendly because the ash was produced with optimum parameters (lowest acid concentration and solar drying). The ash obtained using the appropriate pre-treatment and incineration parameters was found to be amorphous, chemically stable, and ultra-fine. Pozzolanic reactivity test also revealed that the ash possessed quite high pozzolanic reactivity index and suitable to be used as cement replacement material. It is evident that the ash enhances the mechanical properties of the mortar specimens tested.

KEYWORDS: Sugarcane bagasse; Acid treatment; Solar drying; Incineration temperature; Pozzolanic reactivity

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