CERIS : Civil Engineering Research and Innovation for Sustainability

Environmental impact and technical performance of recycled concrete containing municipal solid waste incinerator bottom ash

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Period
2018-2024

Funding
APGES scholarship

Summary

As the world's population is increasing, a large quantity of materials is produced every year, 50% of which come from construction activities. The production of these materials causes a great consumption and depletion of natural resources along with increasing toxic emissions. Concrete plays an important role in the construction world and it is considered one of the main materials used in construction, the demand for of which is increasing rapidly.

Concrete consists of cement, coarse and fine natural aggregates, water, and admixture(s). The production of cement was 4,100,000 tons in 2018. At the same time, the production of aggregate is to reach 51.7 billion metric tons in 2019, representing an annual growth rate of 5.2%. The production of cement is growing rapidly, meanwhile, a huge amount of power is used to grind the raw materials to produce cement. The main goal of this thesis is to produce green concrete mixes by simultaneously replacing coarse nature aggregate with coarse recycled aggregate, and cement with municipal solid waste incinerator bottom ash (MIBA). This will lead to the development and production of new construction materials that will contribute to advancing the knowledge on sustainable concrete.

The proposed methods and materials are commercially competitive among supplementary cementitious materials, by: increasing the reactivity of MIBA by means of a treatment with sodium hydroxide; reducing the gas emissions from concrete production; reducing energy consumption; and reducing raw materials consumption.

Keywords

Construction and demolition waste, coarse recycled aggregates, municipal solid waste incinerator bottom ash, supplementary cementitious materials, recycled aggregates, concrete.

Samples of mortar (fly ash, reference concrete, MIBA).