



“Gheorghe Asachi” Technical University of Iasi, Romania



VALORIZATION OF COFFEE WASTE AS BIO-AGGREGATES IN CRUSHED SAND CONCRETE PRODUCTION

Mohamed Guendouz^{1,2*}, Djamila Boukhelkhal^{1,2}, Abdellah Mechantel², Tarek Boukerma²

¹Laboratory of Materials and Environment, University of Medea, Algeria
²Civil Engineering Department, University of Medea, Algeria

Abstract

For environmental reasons, the demand for recycled bio-based by-products and wastes is increasing in the construction sector nowadays. Furthermore, the fraction of organic waste in household waste is significantly increasing over time. The objective of this work is to investigate the possibility to produce a new sand concrete (SC) based on spent coffee grounds (SCG) as alternative bio-aggregates. To achieve this objective, different dosages between 5 and 20% of crushed sand were replaced with SCG waste aggregates. The properties of the different SC mixes in the fresh state (workability and air content) and hardened state (porosity, dry density, mechanical strength and thermal properties) were assessed and compared to those for control SC. The experimental results showed that using SCG as bio-aggregates in sand concrete contributes to reducing its workability and mechanical strengths. However, the density and thermal properties are improved with the increasing rate of SCG. Replacing 20 % of the crushed sand with SCG decreased the thermal conductivity of the sand concrete by about 45%. The addition of 10% SCG to sand concrete has been found to be the most suitable rate of incorporation for structural applications with compressive strengths approaching 25 MPa at 90 days. Based on their thermal conductivity results less than 1 W/(m.K), the mixtures with 15 and 20% SCG can be classified as good insulating materials. Finally, the results of this study support the feasibility of using SCG as alternative biowaste aggregates to produce thermally insulating eco-friendly concrete for various types of structural elements.

Keywords: recycling, sand concrete, spent coffee grounds, strengths, thermal properties

Received: September, 2022; Revised final: December, 2022; Accepted: December, 2022; Published in final edited form: January, 2023

* Author to whom all correspondence should be addressed: e-mail: guen12moh@gmail.com; guendouz.mohamed@univ-medea.dz,
Phone: +213779611536;